Metro-North Penn Station Access
Major Investment Study/Draft Environmental Impact Statement

COMPARATIVE SCREENING RESULTS REPORT

Prepared for Metro-North Railroad

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SUMMARY

Metro-North Railroad (Metro-North) is preparing a Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) to examine the potential benefits, costs, and social, economic, and environmental effects of reasonable and feasible alternatives for improving access between the Metro-North service area, east of the Hudson River, and Penn Station and destinations on the West Side of Manhattan. Penn Station access alternatives are being identified, defined, and evaluated through a process of three progressively more detailed sets of analyses. An initial qualitative screening analysis of a long list of preliminary Penn Station access alternatives concluded with selection of five intermediate alternatives for further consideration. The first evaluation phase was documented in the *Initial Screening Results Report* (November 2000), which is available on the Study's website at www.mta.info (see Planning Studies).

This report documents the second technical milestone of the Metro-North Penn Station Access MIS/DEIS process. This milestone is completion of the comparative screening phase of the alternatives evaluation process, and selection of a short list of Penn Station access alternatives and potential new station locations for conceptual engineering definition and detailed operations and environmental analyses in the final phase of alternatives evaluation.

The Study's schedule milestones are as follow:

Date	Milestone	Result or Action
November 2000	Completed qualitative screening of preliminary alternatives	Original 24 Penn Station access alternatives screened to current 5 intermediate alternatives
December 2001	Completed comparative screening of 5 intermediate alternatives and 20 potential new stations	4 alternatives (2 daily, 2 off-peak/weekend) and 5 new stations recommended for advancing to next Study phase
2002	Complete MIS/DEIS Phase	Detailed analyses of 4 short-listed alternatives and 5 station options; make Draft MIS/DEIS available to public; hold Public Hearing to receive comment on MIS/DEIS
2003	Complete FEIS (optional)	Respond to public comments; Submit Final to FTA

The focus of the comparative screen was to highlight the key strengths and weaknesses of each alternative, relative to other alternatives; similarly, potential new station locations were compared against other new-station options. The principal activities in the comparative screening were:

1. definition of two sets of qualitative and quantitative screening criteria and evaluation measures, the first for objective comparison of the potential benefits, costs, and impacts of the intermediate alternatives, the second for comparison of potential new station locations;
2. characterization of five intermediate alternatives, in terms of alignment, any infrastructure requirements for new track connections, and service plans;

3. characterization of 20 potential new stations, in terms of location, type of platform that could reasonably be accommodated, vehicular and pedestrian access, any requirements for access ramps, stairs, and/or elevators, and parking availability;
4. forecasting of each alternative's potential ridership benefits and, separately, of each new-station option's potential ridership benefits;
5. evaluation of the intermediate alternatives and potential new station locations against their respective criteria;
6. summarizing the two sets of results; and
7. consideration of public and agency input in selection of alternatives and new-station options to be advanced to the next Study phase.

Ridership potential of the intermediate alternatives and potential new stations was forecast using the Regional Transit Forecasting Model, consistent with the modeling approach and assumptions used for other regional transportation initiatives currently under study. The ridership potential of the intermediate alternatives for *weekday* travel was forecast without consideration of any new stations, in order to clearly represent the benefits of the basic Penn Station access alternative, separate from those derived with a new station. Ridership potential of the *off-peak/weekend* intermediate alternatives was derived using factors to adjust from the weekday alternatives' assignments to off-peak and weekend travel. These factors were based on the observed relationship between weekday and off-peak/weekend ridership for Metro-North at Grand Central Terminal.

Penn Station-related capacity constraints were not addressed in the definition of the intermediate alternatives' service plans, in order to forecast each alternative's maximum potential ridership benefit with "desirable" levels of service. Service plans and ridership forecasts for the short-listed alternatives advanced to the final, detailed phase of evaluation will be refined to reflect Penn Station capacity conditions and potential opportunities, using data and information provided by the current operators in Penn Station (i.e., Amtrak, Long Island Rail Road, New Jersey Transit).

Potential new stations were analyzed only with the *weekday* Penn Station access alternatives. The service plans and ridership forecast of the intermediate weekday service alternatives were used as the baseline condition for purposes of forecasting ridership to/from each potential new station.

On the basis of the comparative screening analysis, the following Penn Station access alternatives are recommended for further, detailed study:

- Alternative 1: Weekday Hudson Line Service via Empire Connection
- Alternative 1A: Off-Peak/Weekend Hudson Line Service via Empire Connection
- Alternative 2: Weekday New Haven Line Service via Hell Gate Line
- Alternative 2A: Off-Peak/Weekend New Haven Line Service via Hell Gate Line

The following potential new station locations are recommended for further, detailed study in concert with the respective Penn Station access alternative for which each has been evaluated:

Alternative 1: Hudson Line
- West 125th Street
- West 59th Street

Alternative 2: New Haven Line
- Co-op City
- Parkchester
- Hunts Point

A. INTRODUCTION

1. Study Overview

Metro-North Railroad (Metro-North) is preparing a MIS/DEIS to examine the potential benefits, costs, and social, economic, and environmental impacts of reasonable and feasible alternatives for improving access between the Metro-North service area, east of the Hudson River, and Penn Station and destinations on the West Side of Manhattan. The purpose of the MIS/DEIS is to examine the demand for, and the opportunities and constraints related to, providing improved access, and to identify a preferred study alternative for doing so. The Study goals are to improve Penn Station access by reducing travel time; increasing travel options, flexibility, and connectivity in the New York Metropolitan region's transportation system; and to do so in a cost-effective and environmentally sound way, promoting the region's economic and environmental well-being. (The complete list of the Study goals and objectives are included in Appendix A.)

Current Metro-North service terminates at Grand Central Terminal, necessitating up to two transfers on additional modes to reach destinations on the West Side. In addition to providing benefits to Metro-North's riders traveling to/from the West Side of Manhattan, improved access to Penn Station would also improve regional connectivity by providing direct connection at Penn Station between Metro-North territory and Long Island Rail Road (LIRR) and New Jersey Transit (NJTransit) service areas, and to Amtrak service at Penn Station.. Additionally, connections to the Port Authority Trans-Hudson (PATH) trains (nearby, at West 33rd Street) would be facilitated. Access to Penn Station for Metro-North may also provide an alternative Manhattan destination in case of service disruption at Grand Central Terminal. Metro-North Penn Station access would also complement LIRR East Side Access service to Grand Central Terminal.

The Penn Station Access MIS/DEIS is being performed in accordance with Federal Transit Administration regulations and guidelines for preparing a Major Investment Study and an Environmental Impact Statement, in accordance with the National Environmental Policy Act (NEPA) of 1969. The MIS/DEIS includes analysis of alternatives, environmental documentation, and public outreach and interagency coordination. Agency and public scoping meetings were held early in the Study process; public outreach and interagency coordination activities are an ongoing part of the Study.

The Study recognizes that current capacity constraints at Penn Station, and increases in future demand projected by the rail operators now using Penn Station (i.e., Amtrak, LIRR, NJTransit), pose obstacles for introducing Metro-North Penn Station access service during peak periods of Station utilization, especially in the near-term. Therefore, following the forecasting of each alternative's potential ridership benefits in this screening phase of the Study, detailed operations planning and analyses will be performed for the short-listed alternatives in the next Study phase to address capacity issues. Further, the Metro-North Penn Station Access MIS/DEIS is being conducted in coordination with the Metropolitan Transportation Authority (MTA), its constituent agencies, and other regional transportation agencies that are examining a number of major network expansion proposals with relevance to the Penn Station Access MIS/DEIS.

The Study's schedule milestones are as follow:

Date	Milestone	Result or Action
November 2000	Completed qualitative screening of preliminary alternatives	Original 24 Penn Station access alternatives screened to current 5 intermediate alternatives
December 2001	Completed comparative screening of 5 intermediate alternatives and 20 potential new stations	4 alternatives (2 daily, 2 off-peak/weekend) and 5 new stations recommended for advancing to next Study phase
2002	Complete MIS/DEIS Phase	Detailed analyses of 4 short-listed alternatives and 5 station options; make Draft MIS/DEIS available to public; hold Public Hearing to receive comment on MIS/DEIS
2003	Complete FEIS (optional)	Respond to public comments; Submit Final to FTA

2. Purpose and Organization of Document

This report documents the comparative screening evaluation of intermediate alternatives (which were advanced on the basis of an initial screening of a long list of preliminary alternatives) and the comparative screening evaluation of potential new station locations, many of which were suggested during the Study's public scoping process.

The alternatives reviewed in this report are:

- Alternative 1: Weekday Hudson Line service via the Empire Connection
- Alternative 2: Weekday New Haven Line service via the Hell Gate Line
- Alternative 3: Weekday Harlem Line service via the Hudson Line and Empire Connection
- Alternative 1A: Off-peak and weekend Hudson Line service via the Empire Connection
- Alternative 2A: Off-peak and weekend New Haven Line service via the Hell Gate Line

The 20 new-station options evaluated and documented in this report include 10 each, respectively, along the alignments of Alternatives 1: Hudson Line and 2: New Haven Line.

Based on the analysis results, this report identifies the alternatives and station locations that will be advanced for further development and detailed evaluation in the next phase of the Penn Station Access MIS/DEIS process.

This report is comprised of the following sections:

- Section B. provides an overview of the MIS/DEIS' three-tiered alternatives development and evaluation process. It also describes the methodology, criteria, and assumptions used in the comparative screening of alternatives and potential new station locations;
- Section C. identifies and defines the five intermediate alternatives investigated in the comparative screening phase, provides the results of the analyses, and identifies which alternatives have been advanced and which have not been advanced for further, detailed consideration;

- Section D. identifies and describes the 20 potential new station locations investigated in the comparative screen, provides the results of the analyses, and identifies which locations have been advanced and which have not for further, detailed consideration; and
- Section E. provides an overview of the next steps in the MIS/DEIS process.

B. SCREENING PROCESS

1. Overview

The methodology for evaluating alternatives for improving Penn Station access to/from the Metro North east-of-Hudson territory has been structured to facilitate selection, ultimately, of a preferred alternative from among competing options. The alternatives evaluation methodology consists of three levels of progressively more detailed evaluation, as follows:

1. *initial qualitative screening* analysis of preliminary alternatives, evaluating each one independently of the others; on this basis, five intermediate alternatives were advanced for further development and evaluation; the initial phase was documented in the *Initial Screening Results Report* (November 2000);
2. *comparative qualitative and quantitative screening* analysis of intermediate alternatives and potential new station locations, to select which alternatives and related new station locations warrant further, detailed evaluation; this report documents the results of the comparative screen;
3. *detailed, quantitative analysis* of the alternatives, including new station locations, advanced on the basis of the comparative screening analysis, to provide sufficient technical basis for selecting the locally preferred alternative; this will be documented in the MIS/DEIS.

A major factor considered in the comparative screening of intermediate alternatives was their maximum potential ridership benefit for both existing and new market areas. Operating capacity was not addressed in this screening phase so that the maximum potential ridership benefits for each of the intermediate alternatives could be identified. Penn Station-related data and information provided by the current operators – Amtrak, LIRR, NJTransit – will be used to assess the capacity and operating issues in the Penn Station complex as they relate to the Penn Station access alternatives advanced to the next Study phase, on the basis of the comparative screening documented in this report.

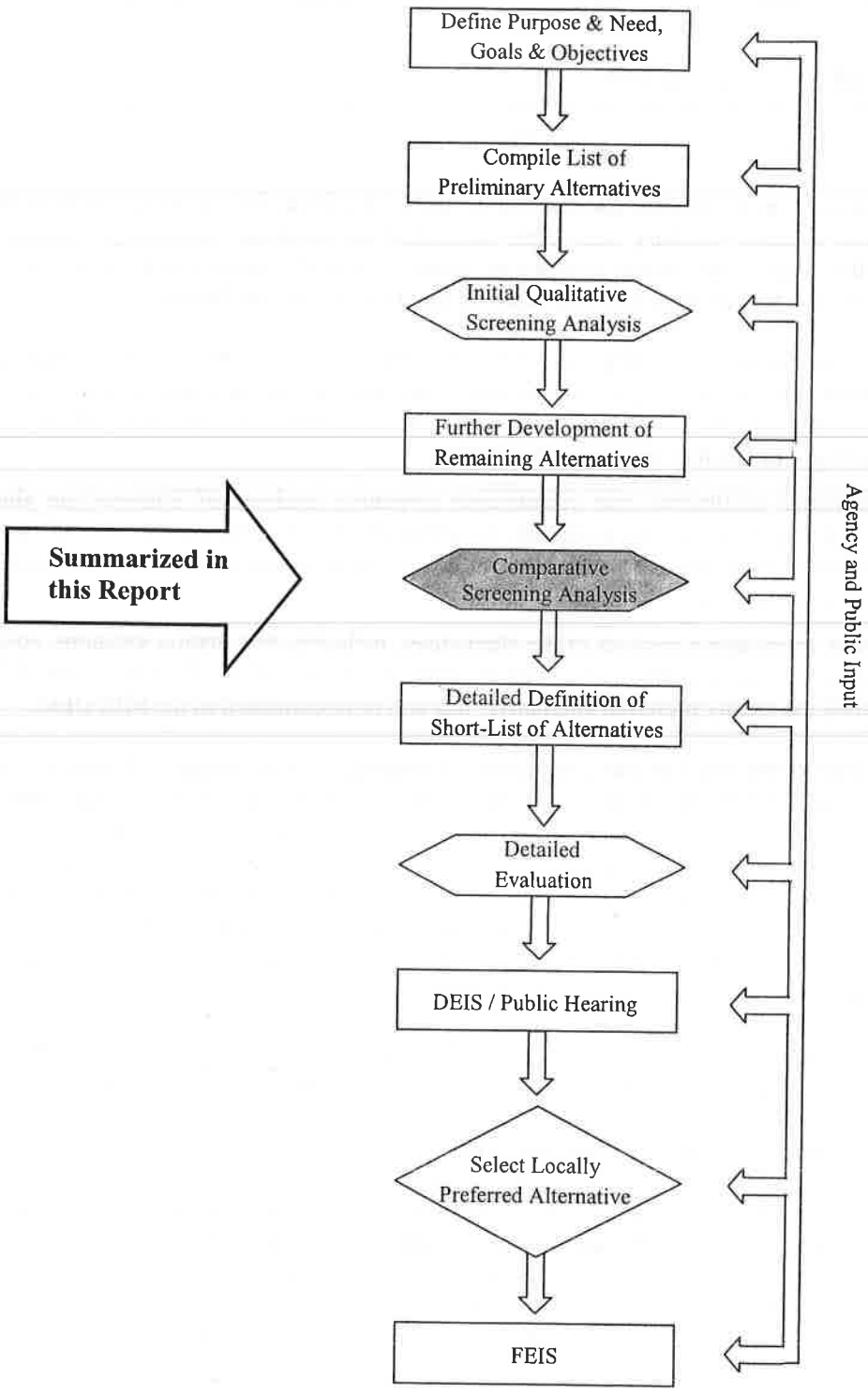
Figure 1 illustrates the phases of the alternatives development and evaluation process. The comparative screening analysis documented in this report is highlighted on Figure 1.

2. Screening Methodology and Criteria

The five Penn Station access alternatives advanced from the preliminary, qualitative screen, as well as potential new station locations along the alternatives' alignments, were evaluated in this comparative screen. The methodology, criteria, and evaluation measures discussed in this report are more thoroughly described in the Study's *Comparative Screening Methodology Report*, which has been posted on the Study's website at www.mta.info (see Planning Studies)..

The purpose of the comparative screening is to highlight the key strengths and weaknesses of each alternative, relative to other options. The same purpose applies to the comparative screening of potential new station locations along a given Penn Station access alternative's alignment.

Figure 1
Alternatives Development and Evaluation Process


Define Purpose & Need, Goals & Objectives
Compile List of Preliminary Alternatives
Initial Qualitative Screening Analysis
Further Development of Remaining Alternatives
Summarized in this Report
Comparative Screening Analysis
Detailed Definition of Short-List of Alternatives
Detailed Evaluation
DEIS / Public Hearing
Select Locally Preferred Alternative
FEIS
Agency and Public Input

The new station locations were screened separately from the intermediate alternatives to focus on each location's site-specific opportunities and constraints, and potential benefits and impacts. The most promising of the potential new stations located along each intermediate alternative's alignment are identified in this report. These will be advanced for more detailed study, with each station integrated with the associated Penn Station access alternative that is also advanced to the next phase.

Ridership Forecasting of Intermediate Alternatives. Ridership potential of the intermediate alternatives (i.e., Alternatives 1, 2, and 3) for weekday travel was forecast without consideration of any new station location, in order to clearly represent the benefits of the basic Penn Station access alternative, separate from those derived with a new station(s). Ridership potential of the off-peak/weekend intermediate alternatives (Alternatives 1A and 2A) was derived using factors to adjust from the weekday alternatives' AM peak-period assignments to off-peak and weekend travel. Penn Station-related capacity constraints were not addressed in the definition of the alternatives nor in their comparative screening, in order to forecast each alternative's maximum potential ridership benefit[1].

Ridership forecast modeling for the comparative screening analyses was conducted using the Regional Transit Forecasting Model. This is consistent with the modeling approaches and assumptions used for other regional transportation initiatives currently under study. The Regional Transit Forecasting Model is also being used for the MTA's Lower Manhattan Access Study; the LIRR's East Side Access Project; and the Access to the Region's Core Study, sponsored by NJTransit, the Port Authority of New York & New Jersey, and the MTA.

Ridership Forecasting of New Station Options. The new station options were analyzed only with the *weekday* service alternatives. The service plans and ridership forecasts for the intermediate weekday service alternatives served as the baseline condition for the station options' travel time savings and ridership potential. The effects of introducing one or more new station locations with a given weekday Penn Station access alternative were evaluated initially in terms of travel time. A series of ridership forecast modeling runs was conducted to examine the effects of travel time delays associated with generic station stops[2] to obtain an indication of how many new stations would provide overall ridership benefits (i.e., both on the mainline and at the new station), despite increased travel time. Examination of total forecasted arrivals and departures during the weekday AM peak period, at both Penn Station and Grand Central Terminal, revealed that:

- one new station would increase a base intermediate alternative's ridership potential;
- addition of a second new station would, in effect, negate the increase produced by the first station, such that total arrivals and departures with two new stations would approximate the total with no new stations; and
- addition of a third new station would tend to reduce ridership below that forecast for the base alternative with no new stations.

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[1] Using data and information provided by Amtrak, NJTransit, and LIRR – the current operators in Penn Station – the Metro-North Penn Station access alternatives that are advanced to the final, detailed phase of evaluation will be refined to reflect Penn Station capacity conditions and potential opportunities.

[2] Two minutes were added to an alternative's travel time to represent stopping at a non-specified new station. Test runs were conducted assuming two minutes of additional travel-time for any new station, for three scenarios: one new station (2-minute travel-time delay), two new stations (4-minute delay), and three new stations (6-minute delay) with a given intermediate weekday alternative.

On the basis of this initial sensitivity analysis, it was assumed that up to two new stations could be accommodated with a given intermediate Penn Station access alternative, while preserving forecasted ridership benefits. The addition of more than two new stations would result in reduced ridership potential, as the incremental travel time associated with a third new station would outweigh the convenience of direct Penn Station access.

In the comparative screening, patronage at each *specific* new station option was forecast independently of consideration of any other station options, in order to clearly represent each station location's ridership potential in both existing and new market areas. Following the ridership forecast modeling for each station option, a second sensitivity analysis was conducted with five of the best-performing station options. These stations were variously grouped to determine the potential ridership benefits and effects on mainline ridership of introducing more than one specific, rather than generic, new station. It was determined that:

- up to three new stations could be accommodated with a given intermediate weekday alternative with positive ridership effects both on the mainline and at the new stations; but
- the potential ridership benefits and mainline effects derived with the addition of new stations depend on which of the specific new station locations are combined.

Data Sources. Other data and information for the comparative screening analyses were obtained via site visits to each potential new station location and from secondary data sources, particularly for identification of Section 4(f) resources, wetlands, and known and/or suspected hazardous waste sites. (The *Comparative Screening Methodology Report* identifies secondary data sources used in the screening.) Order-of-magnitude capital costs were estimated using unit costs derived from Metro-North. (Appendix C provides costing-related assumptions and unit measures used in the comparative screen.)

Documentation of Screening. Table 1 lists the screening criteria and evaluation measures for intermediate alternatives. Table 2 lists the criteria and evaluation measures used for potential new station locations. These criteria were developed in coordination with the Study's Technical Advisory Committee.

The results of the comparative screening of intermediate alternatives and, separately, of potential new-station options are presented in matrix format, accompanied by explanatory text (see Tables 4, 8, and 10 through 13 in Sections C.4 and D.2, respectively). For each screening, one matrix provides quantitative and qualitative results, in the units defined for each evaluation measure in Tables 1 and 2. Results for the evaluation measures that best serve to differentiate among alternatives and, separately, among new-station options are highlighted on a second set of matrices. These "decision" matrices present the screening results with pie-charts that depict the best- to worst-performing among the competing alternatives and new-station options, relative to the selected evaluation measures.

Table 1
Screening Criteria and Evaluation Measures for Intermediate Alternatives

Screening Criteria	Evaluation Measures
1. An alternative should result in improved travel time to/from Penn Station.	a. Travel time savings in person-hours, per 24-hour period in the forecast year (2020), over base (2020 No-Build) travel time b. Total travel time savings in hours per year (2020) c. Travel time savings per benefiting trip (2020)
2. An alternative should maximize transit ridership potential.	a. Total ridership on new service, in number of passenger trips in the AM peak hour, the AM peak period, and per year, in the forecast year (2020) b. Total net new transit trips per year (2020) c. Total net change in Metro-North ridership, in number of trips over base (No-Build) number of trips per year (2020) d. Net change in non-Metro-North modes, in number of trips diverted, by mode, per year (2020)
3. An alternative should minimize initial capital cost requirements by maximizing use of existing infrastructure.	Order-of-magnitude initial capital cost, in year 2000 dollars, of: a. infrastructure b. property acquisition
4. An alternative should be capable of being constructed without extraordinary techniques, and should minimize conflicts with existing transportation services.	a. High, medium, or low degree of construction complexity b. High, medium, or low potential for disruption of existing transportation services (during construction) c. Order-of-magnitude number of months required for construction
5. An alternative should minimize adverse social, economic, and environmental impacts.	a. Number and types of properties potentially to be acquired or displaced b. Number and types of Section 4(f) resources potentially affected c. Estimated acreage of wetland resources potentially taken d. Number of known and/or suspected hazardous waste sites potentially disturbed by construction

Table 2
Screening Criteria and Evaluation Measures for Station Options

Screening Criteria	Evaluation Measures
1. A new station should enhance a given intermediate alternative's ridership potential, in both existing and new market areas.	a. Ridership at new station as increment to ridership forecast for related intermediate alternative, in total number of arrivals and departures in the forecast year (2020) in: • the AM peak hour; • the AM peak period; and • per year. b. Total net new transit trips per year (2020) c. Total net change in Metro-North ridership, in number of trips over base intermediate alternative's number of trips per year (2020)
2. A new station should be capable of being constructed without extraordinary techniques or cost, and should minimize conflicts with existing transportation services.	a. High, medium, or low degree of construction complexity in terms of: complexity of station design and components; and physical, topographic, or other relevant site conditions b. High, medium, or low cost of new station construction c. High, medium, or low potential for disruption of existing transportation services
3. A new station should promote economic and environmental benefits and minimize adverse social, economic, and environmental impacts.	a. Number and types of properties potentially to be acquired or displaced b. Degree (major, moderate, minor) of economic development potential in station's vicinity c. Number and types of Section 4(f) resources potentially affected d. Estimated acreage of wetland resources potentially taken e. Number of known and/or suspected hazardous waste sites potentially disturbed by construction f. Degree (major, moderate, minor) of existing and potential future vehicular traffic congestion on streets and intersections nearest the station access points
4. Siting and design of a new station should be in conformance with Metro-North's station guidelines and standards, to the maximum extent possible, and should avoid conflict with existing rail services.	a. Conformance with guidance on platform height (low- vs. high-level), location (in relation to tracks), dimensions (width and length), and access b. High, medium, or low degree of ease of station access for pedestrians, taxis/autos, and buses c. Accommodations required for ADA compliance d. Parking availability (abundant, sufficient, insufficient) e. Effect (major, moderate, minor or no conflict) with mainline services f. Reasonableness of spacing between new stations

C. INTERMEDIATE ALTERNATIVES

The intermediate alternatives advanced on the basis of the initial screening for evaluation in this comparative screening include:

- Alternative 1: Weekday Hudson Line service via the Empire Connection;
- Alternative 2: Weekday New Haven Line service via the Hell Gate Line;
- Alternative 3: Weekday Harlem Line service via the Hudson Line and Empire Connection;.
- Alternative 1A: Off-peak and weekend Hudson Line service via the Empire Connection; and
- Alternative 2A: Off-peak and weekend New Haven Line service via the Hell Gate Line.

1. Service Plans

The service plans defined for the "weekday" intermediate alternatives are conceptual, in that no existing or forecasted operational or physical constraints either in Penn Station or along the alignments were considered in their development[3]. As previously noted, the alternatives' service plans were defined to test the upper boundary of future ridership potential, for comparative screening purposes. The following principal assumptions were used in defining the intermediate alternatives' service plans:

- Stopping patterns for the service plans reflect Metro-North zoned peak-period, peak direction service schedules;
- Trip times were based on point-to-point times in Metro-North's 2020 service plan, except for potential new station locations' times, which were developed specifically for these service plans;
- At least 20-minute frequency of service from major stations was defined, representing minimally acceptable peak-period, peak direction service within the standard commutershed, i.e., the distance that people regularly commute to/from work;
- Service schedules for zoned service were not adjusted to provide coordinated, standard spacing between trains at common stations (potential transfer points), nor were potential operating conflicts resolved, given the conceptual nature of the service plans; and

Reverse peak-period service schedules were based on Metro-North's planned (2020) reverse peak-period service from Grand Central Terminal.

Using these assumptions, initial service plans were defined for the AM peak hour for the weekday Hudson, New Haven, and Harlem Line intermediate alternatives. The initial service plans included eight inbound trains each in the AM peak hour for the Hudson and New Haven Line alternatives, and 10 for the Harlem Line alternative. In the outbound direction in the AM peak hour, the service plans included 4 trains for the Hudson Line and 5 each for the New Haven and Harlem Line alternatives.

Following initial ridership forecast modeling using these service plans, load factors[4] were calculated for each train pattern to determine capacity utilization of each alternative's inbound trains. This analysis indicated that trains arriving at Penn Station would be half-full or less

[3] As noted earlier, capacity- and operations-related considerations for the alternatives that are advanced to the next Study phase will be evaluated in detail in the next Study phase, using data and information provided by Amtrak, NJTransit, and LIRR, the current operators in Penn Station.

[4] Load factors were computed for inbound trains arriving at Penn Station, with capacity assumed to be 1,000 passengers per train.

with the defined service patterns. In order to improve the efficiency of the alternatives' service plans (i.e., reduce the frequency of trains in the AM peak hour while retaining most of each alternative's ridership potential), the number of inbound trains was reduced for each alternative to increase passenger loadings per train. Outbound service patterns were not modified, as they were already fewer in number. The reduced service plans, which are defined in Table 3, were then used for subsequent ridership forecast modeling, the results of which are reported in Section C.4, below.

2. Infrastructure Requirements

Infrastructure improvements and related construction cost expenditures that would be required for the physical implementation of an alternative at *any* level of service defined for that alternative were included in this comparative screening. Other infrastructure improvements that may be necessary for implementation of a given alternative – such as double-tracking in certain areas that are currently single-tracked, placement of passing sidings, or addition of a third track – were not considered in the comparative screening. Potential additional improvements, and their related construction costs, will be determined in the next, detailed phase of alternatives development and evaluation, on the basis of refined service plans defined within the context of physical and operational constraints at Penn Station, its approaches, and along the alternatives' full alignments.

As each of the Hudson and New Haven Line alternatives would use existing trackage along their entire lengths, no new infrastructure would be required for track connections for Penn Station access services. .

With the Harlem Line alternative, track reconstruction would be required to accommodate train movements at the former Spuyten Duyvil wye track. After traversing the Harlem Line tracks from Wassaic to the Mott Haven wye track (at CP5), Penn Station-bound trains would then travel northbound on the Hudson Line, cross to track 4, and connect to the southbound Empire Connection at Spuyten Duyvil. The south leg of the former wye track would need to be reconstructed. A cost estimate for this reconstruction was included in the initial capital cost requirement for Alternative 3.

3. Characteristics of the Intermediate Alternatives

Table 3 provides information on the characteristics of Alternatives 1, 2, and 3 -- the Hudson, New Haven, and Harlem Line weekday-service alternatives, respectively -- including alignment, new infrastructure requirements for track connections, and AM peak-hour service plan. The alignments for Alternatives 1A and 2A -- the Hudson and New Haven Lines' off-peak/weekend service alternatives, respectively -- are the same as for their weekday counterparts. The service plans described in Table 3 were to forecast the upper-limit ridership potential of Alternatives 1, 2, and 3. The ridership potential of Alternatives 1A and 2A were derived from Alternatives 1 and 2, respectively, by using factors to adjust from the AM peak-period assignments to off-peak and weekend travel. These factors were based on the observed relationship between Metro-North weekday and off-peak/weekend ridership at Grand Central Terminal.

Figure 2 illustrates the generalized alignments of the Hudson, Harlem, and New Haven Line alternatives. Figure 3 illustrates the track connection that would need to be reconstructed at Spuyten Duyvil for physical implementation of the Harlem Line alternative.

Table 3
Characteristics of Intermediate Alternatives with Full Weekday Service[1]

	Alternative 1: Weekday Hudson Line Service	Alternative 2: Weekday New Haven Line Service	Alternative 3: Weekday Harlem Line Service
Alignment[2]	Hudson Line between Poughkeepsie and Riverdale; Empire Connection in Manhattan.	New Haven Line between New Haven and New Rochelle; Hell Gate Line through Queens.	Harlem Line between Wassaic and Mott Haven; Hudson Line between Mott Haven and Empire Connection; Empire Connection in Manhattan.
Infrastructure Requirement(s) for Connection(s)	None	None	Reconstruction of former wye track and switches at Spuyten Duyvil[3]
Service Plan[4] for AM Peak Hour	***Inbound: 5 Trains*** *2 trains* serving all local stations from Poughkeepsie to Tarrytown; *3 trains* serving all local stations from Tarrytown to Riverdale, then express to Penn Station ***Outbound: 4 trains*** *2 trains* from Penn Station, serving Yonkers, Tarrytown, Ossining, all local stations from Croton-Harmon to Poughkeepsie; *2 trains* from Penn Station, serving all local stations from Riverdale to Croton-Harmon.	***Inbound: 5 trains*** *2 trains* serving all major stations from New Haven to Stamford (skipping Stratford, Southport, Green's Farm, East Norwalk, Rowayton), then express to Penn Station; *3 trains* serving all local stations from Stamford to New Rochelle, then express to Penn Station. ***Outbound: 5 trains*** *3 trains* from Penn Station, serving all local stations from New Rochelle to Stamford; *2 trains* from Penn Station, serving Greenwich and all major stops from Stamford to New Haven (skipping Rowayton, East Norwalk, Green's Farm, Southport).	***Inbound: 5 trains*** *2 trains* serving all local stations from Wassaic to N. White Plains, then express to Penn Station; *3 trains* serving all local stations from N. White Plains to Mount Vernon West, then express to Penn Station. ***Outbound: 5 trains*** *3 trains* from Penn Station, serving all local stations between Mount Vernon West and N. White Plains; *2 trains* from Penn Station, serving all local stations from White Plains to Brewster North.

1. The alignments and infrastructure requirements for Alternatives 1A (Off-Peak/Weekend Hudson Line Service) and 2A (Off-Peak/Weekend New Haven Line Service) are the same as for Alternatives 1 and 2, respectively.
2. See Figure 2
3. See Figure 3
4. Service plans were defined to test upper-limit ridership potential, without consideration of Penn Station capacity constraints. Ridership forecasts for the AM peak period, on an annual basis, and for the weekday off-peak/weekend alternatives (1A and 2A) were derived by factoring the modeled results of the AM peak-hour service plans.

Figure 2
Alignments of Intermediate Alternatives

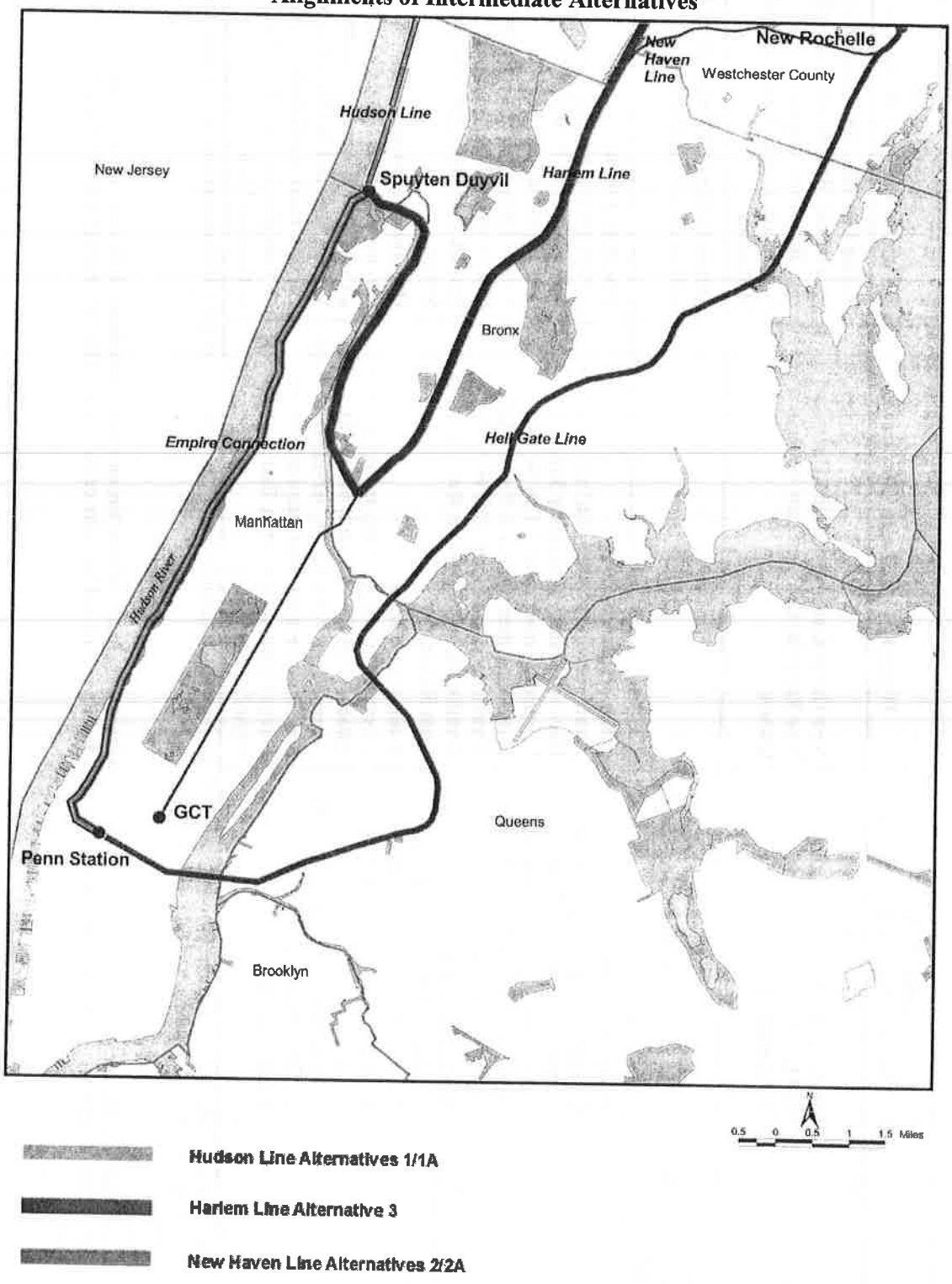
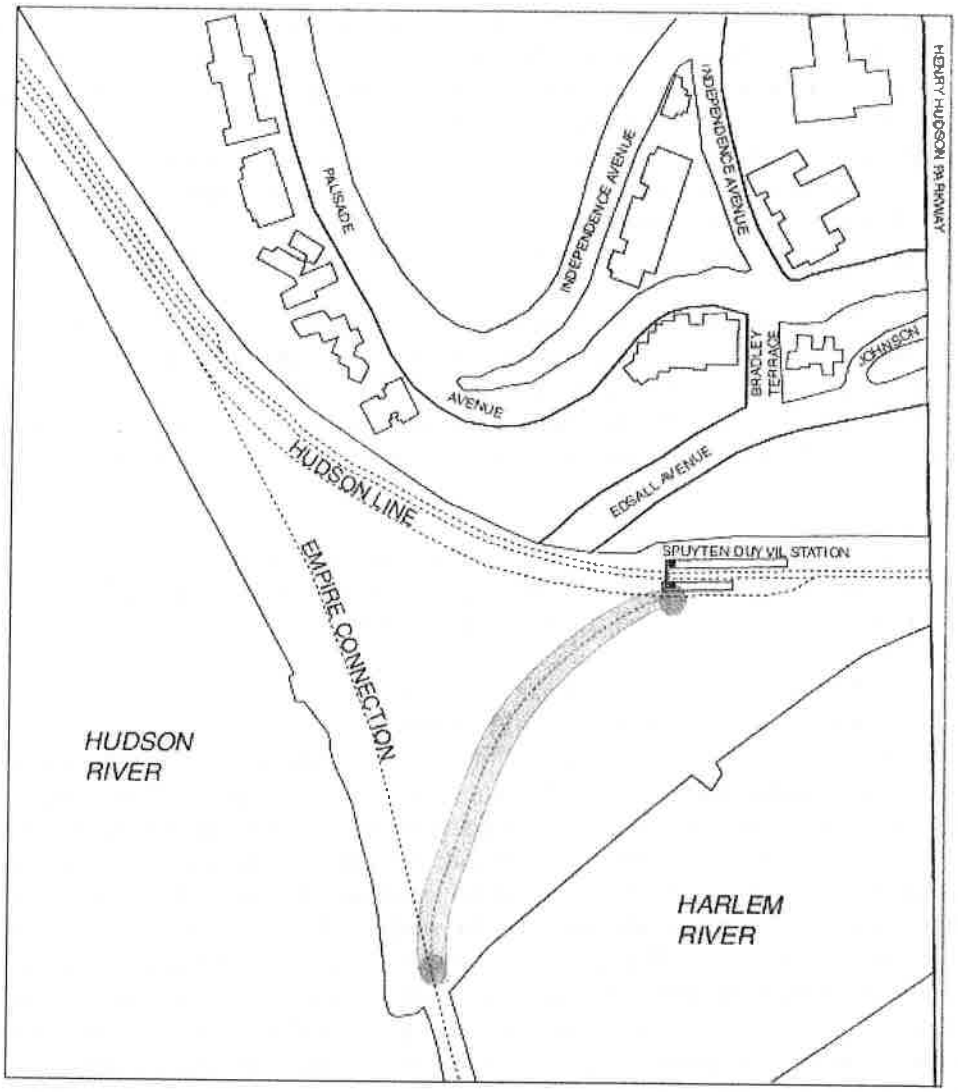


Figure 3
Track Connection Reconstruction Required at Spuyten Duyvil
for Alternative 3 - Weekday Harlem Line Service



4. Results of Screening of Intermediate Alternatives

On the basis of each alternative's performance against the defined screening criteria and related evaluation measures (see Tables 4, 5, 6, and 7), and objective comparison among the alternatives (see Table 8), Alternatives 1: Weekday Hudson Line Service via Empire Connection and 2: Weekday New Haven Line Service via Hell Gate Line are recommended for further study in the final, detailed phase of alternatives development and evaluation. The counterpart Alternatives 1A: Off-Peak/Weekend Hudson Line Service and 2A: Off-Peak/Weekend New Haven Line Service are also recommended to be advanced. This will enable detailed comparison of the ridership potential and other benefits, costs and cost-effectiveness, and social, economic, and environmental benefits and potential impacts of implementing either weekday, off-peak/weekend, or combined services on either or both the Metro-North Hudson and New Haven Lines.

In comparison with Alternatives 1 and 2, Alternative 3: Weekday Harlem Line Service via the Hudson Line and Empire Connection performed poorly, particularly in terms of travel time savings and ridership potential. The full weekday Harlem Line alternative fared relatively poorly even against Alternatives 1A and 2A, the Hudson and New Haven Line off-peak/weekend service options, respectively. Therefore, it is recommended that Alternative 3 not be advanced for further study.

The results of the comparative screening of the intermediate Penn Station access alternatives are discussed in Sections 4a. and 4b., below. Table 4 provides quantitative and qualitative analysis results, by alternative, for each criterion and its respective evaluation measures.

Table 5 provides forecasts for each intermediate alternative's annual travel time savings (in hours) in 2020, compared to the future no-build condition, as well as statistics indicating the average travel time savings (in minutes) per benefiting trip (calculated as total annual travel time savings ÷ total annual trips). The criteria and evaluation measures related to travel time savings and ridership potential proved to be key factors distinguishing relative performance among the competing intermediate alternatives. Both sets of statistics clearly highlight the markedly better performance of Alternatives 1 and 2, the weekday Hudson and New Haven Line services, respectively, particularly relative to Alternative 3, the weekday Harlem Line service. As the off-peak/weekend Hudson and New Haven Line alternatives' results were derived by applying factors to the results of their weekday alternative counterparts, they show the same average travel time savings per benefiting trip. For both average and annual travel time savings, all four Hudson and New Haven Line service alternatives are forecast to provide substantially greater benefits than would the Harlem Line alternative.

Table 6 summarizes each intermediate alternative's ridership potential specifically to and from Penn Station, both in terms of total daily and annual trips, and existing versus new Metro-North customers using Metro-North/Penn Station access service. These results illustrate each alternative's relative ability to satisfy a principal goal of this Study, which is to identify the best means to improve access between the Metro-North east-of-Hudson service territory and Penn Station. While the statistics on benefiting riders are comparable for the New Haven Line and Harlem Line alternatives, direct Penn Station access via the Hudson Line service alternatives are forecast to attract a higher percentage of new Metro-North riders. This may be attributed, at least in part, to these alternatives' average travel time savings per trip which are modestly higher than with the New Haven Line alternatives but markedly better than for the Harlem Line.

Table 8 summarizes the results for the travel time, ridership potential, and construction cost factors in terms of pie-charts that highlight the best- to worst-performing alternatives.

Table 4
Results of Screening of Intermediate Alternatives

Screening Criteria	Evaluation Measures	Penn Station Access Alternatives				
		Alternative 1: Weekday Hudson Line Service	**Alternative 1A: Off-Peak/Weekend Hudson Line Service**	**Alternative 2: Weekday New Haven Line Service**	**Alternative 2A: Off-Peak/Weekend New Haven Line Service**	**Alternative 3: Weekday Harlem Line Service**
The alternative should result in improved travel time to/from Penn Station.	Weekday travel time savings (person-hours per weekday)	2,471	N/A	2,405	N/A	199
	Weekday Off-Peak/Weekend travel time saving (person-hours per off-peak & weekend periods)	N/A	1,230	N/A	1,197	N/A
	Annual travel time savings (person-hours per year)	716,590	212,738	697,450	207,055	57,710
The alternative should maximize transit ridership potential.	Total ridership for new service: AM peak hour AM peak period Annual	 2,513 5,087 3,540,629	 -- -- 1,051,124	 3,215 6,508 4,529,791	 -- -- 1,344,782	 1,350 2,733 1,337,589
	Total new transit trips (annual)	582,878	179,833	591,147	178,139	226,743
	Net change in Metro-North ridership (number of net new trips per year)	1,047,973	311,117	772,134	229,227	333,097
	Net change in non-Metro-North modes (number of trips diverted, by mode, per year)	Auto: 582,878 Subway: 344,233 Bus: 120,872	Auto: 179,833 Subway: 97,165 Bus: 34,119	Auto: 591,147 Subway: 162,840 Bus: 18,148	Auto: 178,139 Subway: 45,965 Bus: 5,123	Auto: 226,743 Subway: 62,464 Bus: 43,889
The alternative should minimize initial capital cost requirements by maximizing the use of existing infrastructure.	Order-of-magnitude initial capital cost of: Infrastructure (in year 2000 dollars)	None	None	None	None	$1,532,375 for wye track (track, 3rd rail, and interlocking modifications)
	Property acquisition (in year 2000 dollars)	None	None	None	None	None
The alternative should be capable of being constructed without extraordinary techniques, and should minimize conflicts with existing transportation services.	Degree of construction complexity (high, medium, or low)	Low	Low	Low	Low	Low
	Potential for disruption of existing services (high, medium, or low)	Low	Low	Low	Low	Low
	Order-of-magnitude number of months required for construction	N/A	N/A	N/A	N/A	14 months (*12* for interlocking modifications, *2* for track reconstruction)
The alternative should minimize adverse social, economic and environmental impacts.	Number of properties to be acquired or displaced	None	None	None	None	None
	Number of contaminated sites potentially disturbed	None	None	None	None	1 - Moderate potential for PCB, pesticide, and historic fill contamination at wye track
	Section 4(f) resources potentially taken	None	None	None (catenary structures may be considered historic)	None (catenary structures may be considered historic)	None
	Estimated acreage of wetlands potentially taken	None	None	None	None	None (wetlands adjacent area waiver may be necessary)

Table 5
Intermediate Alternatives' Travel Time Savings, Compared to No-Build

Alternatives	Average Travel Time Savings per Benefiting Trip (minutes)	Annual Travel Time Savings (person hours per year)
Alternative 1: Hudson Line Weekday Service	12	716,590
Alternative 2: New Haven Line Weekday Service	9	697,450
Alternative 3: Harlem Line Weekday Service	2	57,710
Alternative 1A: Hudson Line Off-Peak/Weekend Service	12	212,738
Alternative 2A: New Haven Line Off-Peak/Weekend Service	9	207,055

* *Travel times include all modes*

Table 6
Intermediate Alternatives' Ridership to/from Penn Station, Compared to No-Build

Alternatives	Increase in Daily (2020) Trips As Compared to the No-Build to/from PSNY (000's)	Increase in Annual (2020) Trips as Compared to the No-Build (000's)		
		To/from PSNY	Benefiting Riders	
			Existing MNR Riders	New MNR Riders
Alternative 1: Hudson Line Weekday Service	12	3,541	71%	29%
Alternative 2: New Haven Line Weekday Service	16	4,529	82%	18%
Alternative 3: Harlem Line Weekday Service	5	1,338	85%	15%
Alternative 1A: Hudson Line Off-Peak/ Weekend Service	3	1,051	71%	29%
Alternative 2A: New Haven Line Off-Peak/ Weekend Service	4	1,345	82%	18%

Table 7
Intermediate Alternatives' Change in Regional Travel, Compared to No-Build

Alternatives	Change in Annual (2020) Trip Volume by Mode, Compared to No-Build (000's)				
	Auto	Commuter Rail	Subway	Bus	Net New Transit
Alternative 1: Hudson Line Weekday Service	(583)	1,048	(344)	(121)	583
Alternative 2: New Haven Line Weekday Service	(591)	772	(163)	(18)	591
Alternative 3: Harlem Line Weekday Service	(227)	333	(63)	(43)	227
Alternative 1A: Hudson Line Off-Peak/Weekend Service	(180)	311	(97)	(34)	180
Alternative 2A: New Haven Line Off-Peak/Weekend Service	(178)	229	(46)	(5)	178

4a. Intermediate Alternatives Advanced for Further Study

Alternative 1: Weekday Hudson Line Service via Empire Connection

As shown in Tables 4 and 8, Alternative 1 performs very favorably against the comparative screening criteria. Alternative 1 would provide notable travel time savings and ridership benefits (also see Tables 6 and 8), while using existing infrastructure and without imposing adverse construction-related or social, economic, or environmental impacts. The forecast annual travel time savings (716,590 person-hours per year) would provide an average travel time savings of 12 minutes per benefiting trip. Penn Station access ridership of 3,540,629 annual person trips, of which nearly 30 percent represent new Metro-North riders (see Table 5), would show gains both in net new transit trips (582,878 trips annually) and total Metro-North ridership (annual increase of 1,047,973 trips). This is reflected in the forecasted diversions from non-Metro-North travel modes to commuter rail (Table 7); while diverting more trips from both subway and bus services than would the other alternatives, nearly 60 percent of trips diverted from other modes to Alternative 1 would be from auto travel (582,878 diverted trips).

Alternative 1 would incur no cost for new track connections or property acquisition. Construction-related complexity would be low and no social, economic, or environmental effects considered in the comparative screen would result with implementation of Alternative 1, as is also true for the other alternatives.

performs comparably to Alternative 1 for the construction-related and environmental criteria. This alternative will be advanced for further, more detailed study -- including ridership forecasting with the RTF model, refined to forecast, rather than factor, off-peak/weekend ridership potential, based on refined service plans -- in the next phase of analysis.

Alternative 2A: Off-Peak/Weekend New Haven Line Service via Hell Gate Line
As shown in Tables 4 and 5, the off-peak/weekend New Haven Line service alternative, counterpart to Alternative 2, would realize a ridership potential of 1,344,782 person-trips per year, with an annual travel time savings of 207,055 person-hours, approximately 30 percent that of the full weekday service option and nearly four times that of Alternative 3, the full weekday Harlem Line service. A total of 178,139 annual new transit trips and 229,227 annual new Metro-North trips would be generated with Alternative 2A. Penn Station access ridership would be gained through diversion of 178,139 auto trips, and 45,965 subway and 5,123 bus trips per year (Table 7).

As with Alternative 2, no new infrastructure would be required for track connections for off-peak/weekend Penn Station access service via the New Haven Line and Hell Gate Line. Also as with Alternative 2, this alternative performs well in terms of the construction-related and environmental criteria (see Table 4). Alternative 2A will be advanced for further study in the next phase of detailed evaluation.

4b. Intermediate Alternative Not Advanced

Alternative 3: Weekday Harlem Line Service via Hudson Line and Empire Connection
Compared to Alternatives 1 and 2, the Harlem Line alternative performs least favorably in terms of projected travel time savings, providing only about 8 percent of the annual travel time savings benefit projected for either the Hudson Line or New Haven Line weekday service alternatives, and less than 30 percent of the travel time savings with the off-peak/weekend service Alternatives 1A and 2A (see Table 4). The forecast travel time savings per benefiting trip would average just two minutes (see Table 5) compared to 12 and 9 minutes, respectively, with Penn Station access service via either the Hudson or New Haven Line alternative. The Harlem Line alternative's modest travel time savings is due to its indirect route -- traveling northbound on the Hudson Line before connecting to the southbound Empire Connection -- and slower train operating speeds to make the necessary transitional movements. The travel time delay incurred to achieve these connections reduces the attractiveness of this alternative's Penn Station-bound service, as indicated by its modest ridership potential, compared to either the Hudson or New Haven Line alternatives.

As shown in Table 4, Alternative 3 performs poorly compared to the other alternatives for all ridership-related evaluation measures in the comparative screen. Forecasts for Alternative 3 show approximately half the ridership potential of Alternative 1 for Penn Station access service, and even lower potential compared to Alternative 2, for which Penn Station access ridership projections are the most robust. Metro-North's net ridership gain with the Harlem Line alternative would be only 43 percent of the net Metro-North gain projected for the New Haven Line alternative and 32 percent of that for the Hudson Line alternative. In general, ridership potential of the Harlem Line alternative would be more comparable to that of the off-peak/weekend New Haven Line and Hudson Line service alternatives, 1A and 2A, respectively.

Implementation of Alternative 3 would require reconstruction of the wye track (including track, third rail, and interlocking modifications) at Spuyten Duyvil to connect the Hudson Line and Empire Connection portions of the alternative's alignment. The western segment of the wye alignment is owned by Amtrak; therefore, upgrades of the Amtrak and Metro-North interlockings – at the western and eastern ends, respectively, of the reconstructed wye track – would also require modifications to their controls. The construction cost of the Spuyten Duyvil connection is

estimated at approximately $1.5 million, with no property acquisition required. As the property through which the wye would be reconstructed is railroad right-of-way, and the connection would be built between two rail lines, the site has moderate potential for contamination. Contaminants typically associated with former rail properties include PCBs, organic and inorganic pesticides/herbicides, and historic fill.

As summarized in Table 8, Alternative 3 performs least effectively among the intermediate alternatives for the evaluation measures that highlight the principal differences among them, namely, travel times savings, ridership potential, and construction cost.

D. POTENTIAL NEW STATION LOCATIONS

During the Study's public scoping process, numerous suggestions were made regarding new station locations for consideration in the planning of Penn Station access alternatives. The suggested locations for new stations were investigated and evaluated in a comparative screening separate from that applied to the Penn Station access alternatives with which any of the possible new stations might be associated. The comparative screening of potential station locations was conducted to evaluate each station option's site-specific opportunities and constraints related to construction and operation. On this basis, the most promising of the locations were selected along the alignments of Penn Station access alternatives advanced to the next Study phase.

Table 9 lists the new station locations that were identified through the scoping process. Of those listed in Table 9, all but three options were put through the full comparative screening evaluation (the rationale for excluding these from the comparative analysis is provided in Section D.3).

Figure 4 indicates the general locations of the station options addressed in the comparative screening, along the alignments of the intermediate Hudson and New Haven Line alternatives. Aerial mapping is provided in Appendix B for each of these locations. The aerials indicate the physical area, or envelope, within which a new station platform could feasibly be sited, based on site visits. Characteristics of these new station options are described in Section D.1.

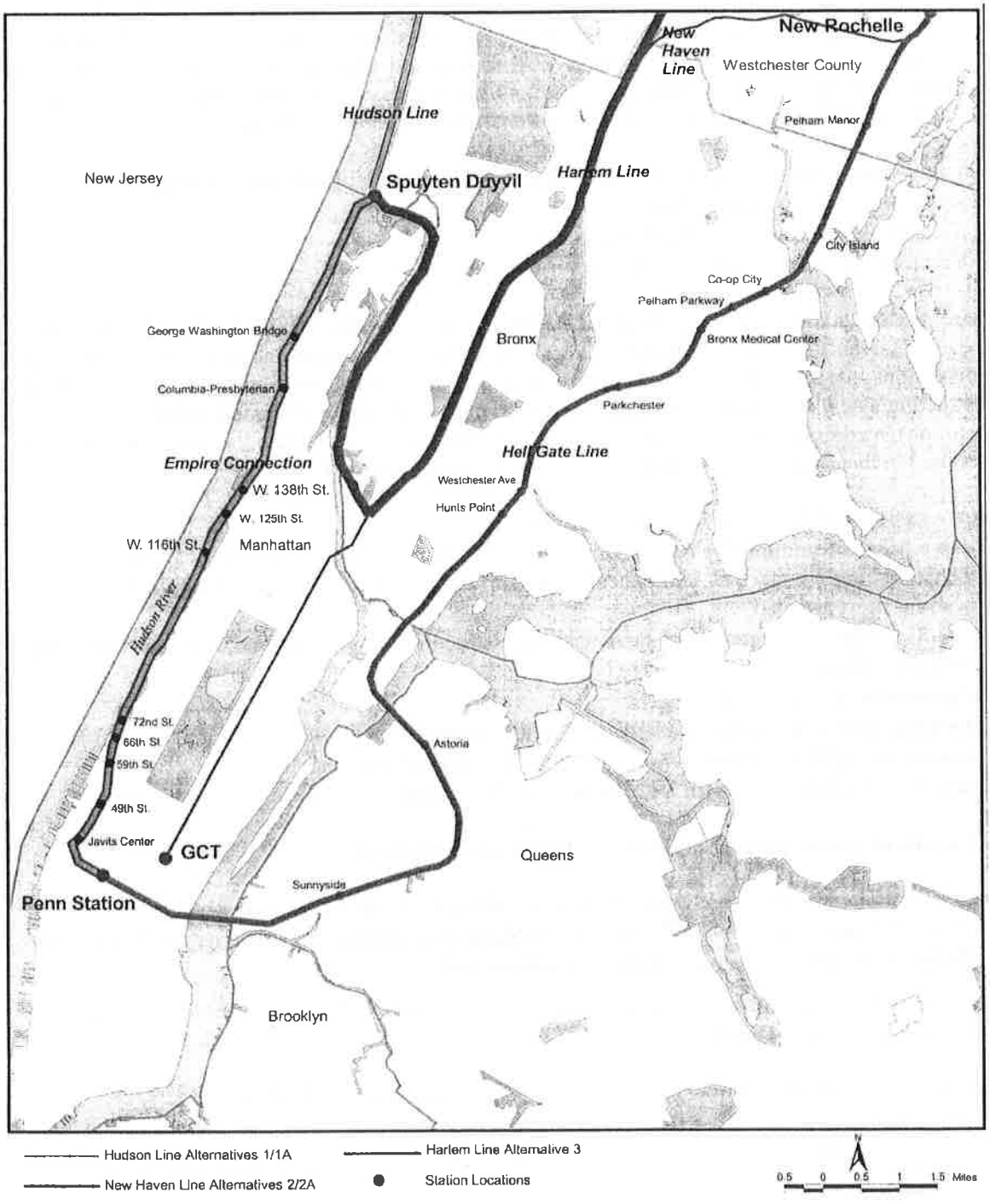
Table 9
List of Suggested Potential New Station Locations[1]

Along Alignment of Alternative 1: Weekday Hudson Line Service	• Enlarged station in Tarrytown, at base of Tappan Zee Bridge • West 181st Street, or West 169th Street, in vicinity of the George Washington Bridge • Columbia Presbyterian Medical Center, Washington Heights • West 138th Street, in vicinity of City College of New York • West 125th Street, to serve Harlem • West 116th Street, to serve the Columbia University area • West 72nd Street • West 66th Street • West 59th Street vicinity • West 49th or 50th Street • Near Jacob Javits Center, West Side Yard
Along Alignment of Alternative 2: Weekday New Haven Line Service	• Site of former Pelham Manor station • City Island • Co-op City • Vicinity of Pelham Parkway • Near Bronx Medical and Psychiatric Centers/Einstein Hospital/Eastchester Road • Parkchester at Unionport and White Plains Roads • Westchester Avenue • Hunts Point, possibly in former Amtrak station • At Astoria Station • Woodside, to connect to LIRR Woodside Station • Sunnyside Yard
Along Alignment of Alternative 3: Weekday Harlem Line Service[2]	• Yankee Stadium • Station locations suggested in Manhattan portion of Alternative 1: Weekday Hudson Line Service

1 Suggestions made during the public scoping process for consideration of new stations were, by and large, generalized rather than specific locations. During the comparative screening process, in-field investigations were conducted of each location to define a physical "envelope" within which a new station could potentially be sited.

2 Locations listed for Alternative 1 (excluding Tarrytown) could also apply to Alternative 3.

Figure 4
Station Locations Investigated in Comparative Screen



1. Characteristics of New Station Options

The characteristics of each new station option along the alignments of the intermediate Hudson and New Haven Line weekday service alternatives are described, below, in Sections D.2a and D.2b, respectively. The physical envelope within which each new station could be constructed was conservatively defined through visual observation and photographs of each location, and available mapping of existing trackage, surrounding roadways, land uses, and built structures. (See Appendix B for mapping of each new-station option's generalized location.)

Each new-station location was examined to determine the feasibility of constructing:

- a platform of at least 6 car-lengths;
- a shelter (i.e., not a station building); and
- any necessary access ramps, stairs, and/or elevators.

For some new station options, additional necessary infrastructure would include limited track relocation for an island platform, an overpass for station or platform access, and/or structural modifications for catenary or third rail relocation. The order-of-magnitude capital cost of constructing a new station in each suggested location was estimated, and rated as either low ($1 – 10 million), medium ($10-20 million), or high ($20+ million). (Cost-related assumptions and unit costs used in the capital cost estimating of new stations are provided in Appendix C.)

To the extent possible, the stations were sited to:

- serve trains of minimum 6 car-lengths; locations which could not accommodate 6 car-length platforms and those that could accommodate longer car-lengths, should future ridership warrant it, were noted;
- avoid sensitive and protected land uses and structures, e.g., parkland, historic resources, wetlands, residences;
- minimize property takings;
- facilitate pedestrian and vehicular access to the station;
- conform with Metro-North station siting and design guidance; and
- comply with Americans with Disabilities Act (ADA) requirements.

2. Results of Comparative Screening of New Station Options

Five new station options are recommended for advancement to the next Study phase:

- West 125th Street and West 59th Street for evaluation in concert with Alternative 1: Weekday Hudson Line Service via the Empire Connection, and
- Co-op City, Parkchester, and Hunts Point with Alternative 2: Weekday New Haven Line Service via the Hell Gate Line.

Each of the new station options considered along the alignments of Alternatives 1 and 2 are described, below, as are the comparative screening results for each. Sections 2a. and 2b., respectively, discuss the rationale and justification for the five new station options advanced and for the 16 options not recommended for the next Study phase. Quantitative and qualitative analysis results for all 10 new Hudson Line station options are provided in Table 10. Table 11 illustrates results for the evaluation measures that best serve to differentiate among Hudson Line station options, in terms of best- to worst-performing new stations for each evaluation measure. Tables 12 and 13 display the results similarly for evaluation of the station options along the New Haven Line alternative.

2a. Locations along Alternative 1: Hudson Line/Empire Connection Alignment

Station Options Advanced for Further Study

Ridership potential at each of the station options was forecast independently of consideration of any other new-station locations, in order to clearly distinguish each station's ridership potential, in both existing and new market areas. With a distance of slightly more than 2.5 miles between them, the West 59th Street and West 125th Street station locations are reasonably spaced, for purposes of providing Metro-North Penn Station access service to/from the West Midtown and Upper Manhattan areas from/to the Metro-North east-of-Hudson service area. A station at West 59th Street may also serve some portion of the ridership potential forecast for the West 49th and West 66th Street new-station options; similarly, a station at West 125th Street may serve the West 116th and West 138th Street markets.

West 125th Street – A station with two side platforms could be constructed on a site bounded by St. Clair Place and West 125th Street. As the station would have to be sited on an elevated portion of track, each side platform would be limited to 4 car-lengths. Modifications to existing structural supports may be necessary. The station would be accessible from either St. Clair or West 125th Street. Passenger access between the elevated station platforms and the street would be via newly constructed stairwells and/or elevators, the latter of which would be required for ADA compliance.

From among the five new station locations considered in northern Manhattan, West 125th Street is one of only two that would avoid use of a Section 4(f) parkland[5] (see Table 10) and may, therefore, be considered an avoidance alternative in compliance with federal Section 4(f) requirements. Introduction of a new station at West 125th Street would pose minimal adverse environmental impact (related to its moderate degree of contamination) and cost in the mid-range of estimated construction costs for the new-station options. The station would serve as a noteworthy enhancement of West Harlem's transportation network, having the benefit of very easy access to/from West 125th Street, Route 9A, and the 125th Street IRT subway station. Based on its performance relative to other evaluation measures (see Tables 10 and 11), West 125th Street is a reasonable new-station option to serve the northern Manhattan segment of the Hudson Line weekday service alternative, and specifically the West Harlem area which -- along with Central and East Harlem -- lies within the Upper Manhattan Empowerment Zone (EZ).

Designated in 1994, the Upper Manhattan EZ was created to initiate and stimulate business development activities and create employment in Harlem, and entitles the community to government funding and tax incentives towards the end of economically diversifying the community. The EZ's efforts have also focused on capitalizing on Harlem's cultural history to stimulate tourism to the area. On the strength of initial EZ-funded economic development successes and Harlem's re-emergence as a tourist destination, Harlem is undergoing what has been characterized as a "Second Renaissance."

New York City, the predominant landowner in the potential new station's vicinity, has been an active participant in seeking economic development in the area. For example, the new-station location identified in this Study is adjacent to the City-owned West 125th Street Harlem Piers area, which in recent years has been the focus of much redevelopment planning. The New York City Economic Development Corporation (NYCEDC) is developing a master plan for revitalization and pedestrian enhancement of this western segment of the West 125th Street

[5] Section 4(f) of the US Department of Transportation Act of 1966 prohibits use of any publicly owned park, recreation area, wildlife or waterfowl refuge, or historic site unless there is no feasible and prudent alternative to using the protected resource, and all possible planning is done to minimize harm to the affected resource.

corridor. In addition to designing open space connections to adjacent parks, the Master Plan is intended to examine the feasibility of constructing a waterfront pier, possibly for ferry docking, among other uses. The NYCEDC master planning for the Harlem Piers area complements the broader, community-based Harlem on the River Project, which seeks to enhance economic development opportunities and revitalization of this West Harlem waterfront area. The Harlem on the River project incorporates a new commuter rail platform along the existing rail trackage, in essentially the same location as has been defined for purposes of this Study. The West 125th Street new-station location is recommended to be advanced for further study, both to serve the northern Manhattan market for Penn Station access via the Hudson Line, and to provide improved transportation access and system connectivity in support of the multiple economic development initiatives in West Harlem and the rest of the Upper Manhattan EZ.

West 59th Street Vicinity – An island platform station could be sited in an open cut in the railroad right-of-way immediately north of the tunnel portal at West 60th Street, east of West End Avenue. The station would be below grade, and pedestrian access between the platform and West End Avenue would be via newly constructed stairwells and/or an elevator, the latter required for ADA compliance.

A new station at West 59th Street shows the highest ridership potential for Penn Station access service, among the options considered for the Hudson Line weekday service alternative, with 2,625,785 person-trips per year (see Table 10). It is also forecast to have the highest number of net new transit trips (241,443 annually) and a net increase of 1,349,405 Metro-North trips per year. The construction cost for this new station is among the lowest of the stations evaluated. An island platform of only 4 car-lengths could be accommodated at this location, due to the physical configuration of the site. Construction of a more desirable 6-car-length platform would require cut-and-cover construction on 11th Avenue/West End Avenue, at significantly greater cost than has been estimated for the shorter station platform's construction. Based on this screening-level review of the presence of potential on-site contamination (using secondary sources), this site is one of three sites evaluated with a high degree of potential contamination. However, it is recommended that this site be advanced for further study on the strength of its significant ridership potential, compared to all of the other potential new-station locations, and particularly in the West Midtown segment of the Hudson Line alternative's alignment (see Table 11). In terms of other environmental measures considered in this screen, the West 59th Street site performs better than or comparable to all other potential new station options evaluated.

Station Options Not Advanced for Further Study

George Washington Bridge Vicinity – A station with two side platforms of 4 car-lengths could be constructed west of West 181st Street (Plaza Lafayette), but would unavoidably encroach on Fort Washington Park. Pedestrian and vehicular access to the station would be via a newly constructed extension of West 181st Street that would span the Henry Hudson Parkway, and approach the station at grade. Passengers traveling southbound would use a newly constructed overpass from the northbound side. Two elevators would be provided to accommodate use of the overpass, in compliance with ADA requirements.

Table 10
Comparative Screening Results of Potential New Station Locations Along Alignment of Alternative 1: Hudson Line via Empire Connection

Screening Criteria	Evaluation Measures	George Washington Bridge[1]	Columbia Pres. Medical Center[1]	West 138th St.	West 125th St.[2]	West 116th St.
A new station should enhance an alternative's transit ridership potential.	Potential ridership (no. of person-trips) for the station: AM peak hour AM peak period Annual (2020)	 1,316 2,664 1,854,276	 1,470 2,976 2,071,018	 1,086 2,198 1,529,815	 748 1,515 1,054,356	 1,379 2,791 1,942,341
	New transit trips per year (2020) due to new station as compared to base alternative	567	83,325	52,314	(22,319)	112,626
	Total net change in Metro-North ridership due to new station, in person-trips over base intermediate alternative's number of trips per year (2020)	1,337,294	1,441,232	664,631	354,584	1,180,165
A new station should be capable of being constructed without extraordinary techniques or cost, and should minimize conflicts with existing transportation services.	Degree of construction complexity (high, medium, or low) due to site conditions	medium	medium	low	Medium (on an embankment, adjacent highway right-of-way)	Medium (inside a tunnel, must excavate)
	Order-of-magnitude initial capital cost of new station construction (in year 2000 dollars)	high ($20+ million, 4 car-lengths, 2 side platforms, overpass, 2 elevators, road and pedestrian access)	high ($20+ million, 4 car lengths, 2 side platforms, overpass, 2 elevators, road and pedestrian access)	Medium ($10 – 20 million, 6 car-lengths, island platform, track relocation, one elevator, repair of marginal street)	medium ($10 – 20 million , 4 car-lengths, 2 side platforms, 2 elevators, noise barrier for one platform)	Medium ($10 – 20 million, 6 car-lengths, island platform, track relocation, one elevator, site access; includes excavation)
	Potential for disruption of existing services (high, medium, or low)	low	low	low	low	medium (inside tunnel, and within a park)
ew station should minimize adverse social, economic and environmental impacts.	Economic Development Potential	low	low	moderate	high	low
	Number of properties to potentially be acquired or displaced	1	1	none	none	1
	Section 4(f) resources potentially taken	2 acres of Fort Washington Park (adjacent historic properties would be avoided)	2 acres of Fort Washington Park	none (access is from state park bridge)	none (adjacent historic properties would be avoided)	2 acres of Riverside Park
	Estimated acreage of wetlands potentially taken	none (wetlands adjacent area waiver may be necessary)	none	none	none	none
	Number of contaminated sites potentially disturbed	none	none	1 (PCBs, historic fill; moderate contamination)	2 (PCBs, pesticides, historic fill; moderate contamination)	1 (PCBs, historic fill; low contamination)
	Degree (major, moderate, minor) of existing and potential future traffic congestion near station access points	moderate (access from Lafayette Plaza; existing congestion on bridge off-/on-ramps)	moderate (165th Street would be access point)	moderate (limited drop-off potential)	moderate	moderate (limited drop-off potential)
Siting and design of a new station should be in conformance with Metro-North's station guidelines and standards, to the maximum extent possible.	Conformance with platform height, location, dimension, and access and guidance	vehicular and pedestrian access would have to be built (in vicinity of Riverside Drive and Lafayette Plaza)	vehicular and pedestrian access would have to be built	in conformance (platform could be longer if desired)	cannot accommodate 6 car-length platform	Vehicular access would have to be built; is within a tunnel
	Ease of station access (high, medium, low) for pedestrians, taxis/autos, and buses	low, no access currently exists	low, no access currently exists	moderate (limited vehicle access, plenty of pedestrian paths, and IRT is 1 block to east)	high (located at end of West 125th Street, ramps for Route 9A, and IRT is 1 block to east)	moderate (no vehicle access, plenty of pedestrian paths, and IRT is 2 blocks to east)
	ADA compliance	in compliance	in compliance	in compliance	in compliance	in compliance
	Effect on mainline services	minor	minor	minor	minor	minor
	Parking availability (abundant, sufficient, insufficient)	insufficient (minimal on-street parking not near site)	insufficient (minimal on-street parking not near site)	insufficient (minimal on-street parking not near site)	insufficient (minimal on-street parking)	insufficient (minimal on-street parking)

Notes for Table 10:

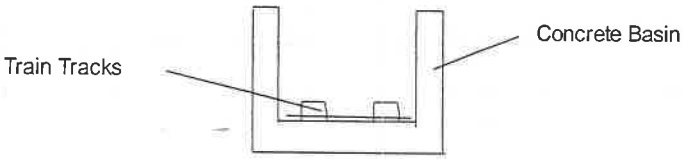
1. Significant grade difference between current roadways and site.
2. Structural condition of entire viaduct would increase cost of station as viaduct should be replaced. Location of station is just north of St. Clair Place, but access should be from 125th St. Station would be above grade (elevated).

Table 10 (cont'd)
Comparative Screening Results of Potential New Station Locations
Along Alignment of Alternative 1: Hudson Line via Empire Connection

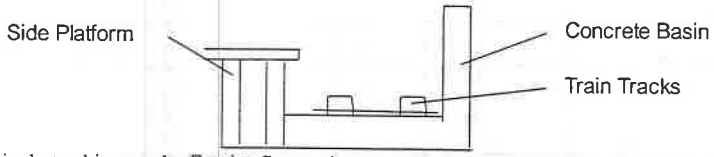
Screening Criteria	Evaluation Measures	West 72nd St.[3]	West 66th St.[3]	West 59th St.[4]	West 49th St.[5]	Jacob Javits Center[6]
A new station should enhance an alternative's transit ridership potential.	Potential ridership (no. of person-trips) for the station AM peak hour AM peak period Annual (2020)	 1,259 2,549 1,774,048	 1,656 3,352 2,332,651	 1,864 3,773 2,625,785	 1,668 3,377 2,350,566	 418 847 589,408
	New transit trips per year (2020) due to new station as compared to base alternative	54,053	225,750	241,443	151,640	(16,225)
	Total net change in Metro-North ridership due to new station, in person-trips over base intermediate alternative's number of trips per year (2020)	729,895	1,188,270	1,349,405	268,990	(87,237)
A new station should be capable of being constructed without extraordinary techniques or cost, and should minimize conflicts with existing transportation services.	Degree of construction complexity (high, medium, or low) due to site conditions	medium (Riverside South Development above site)	medium (Riverside South Development above site)	medium	low	medium (modification of "washtub" track)
	Order-of-magnitude initial capital cost of new station construction (in year 2000 dollars)	low ($1 – 10 million, 6 car-lengths, island platform, track relocation, one elevator)	low ($1 – 10 million, 6 car-lengths, island platform, track relocation, one elevator)	low ($1 – 10 million, 4 car-lengths, island platform, track relocation, one elevator)	low ($1 – 10 million, 4 car-lengths, island platform, track relocation, one elevator)	low ($1 – 10 million, 6 car-lengths, side platform, one elevator)
	Potential for disruption of existing services (high, medium, or low)	low	low	low	low	low
new station should minimize adverse social, economic and environmental impacts.	Economic Development Potential	low	low	moderate	low	high
	Number of properties to potentially be acquired or displaced	none	none	none	none	none
	Section 4(f) resources potentially taken	none (adjacent historic properties would be avoided)	none	none (adjacent historic property would be avoided)	none	none
	Estimated acreage of wetlands potentially taken	none	none	none	none	none
	Number of contaminated sites potentially disturbed	2 (PCBs, pesticides, historic fill; high contamination)	2 (PCBs, pesticides, historic fill; high contamination)	5 or more (PCBs, pesticides; high contamination)	1 (PCBs, historic fill; moderate contamination)	2 or more (PCBs, historic fill; moderate contamination)
	Degree (major, moderate, minor) of existing and potential future traffic congestion near station access points	moderate	moderate	moderate (59th Street MTS is nearby)	low	moderate (auto-related land uses occupy street space)
Siting and design of a new station should be in conformance with Metro-North's station guidelines and standards, to the maximum extent possible.	Conformance with platform height, location, dimension, and access and guidance	in conformance (longer platform would require underground construction)	in conformance (longer platform would require underground construction)	in conformance (longer platform would require underground construction)	cannot accommodate 6 car-length platform (longer platform would require disruptive cut-and-cover construction on West 48th Street)	in conformance (platform could be longer if desired)
	Ease of station access (high, medium, low) for pedestrians, taxis/autos, and buses	high (vehicular and pedestrian access from 72nd Street; pedestrian via 71st Street; 2 blocks to IRT subway)	high (access via Freedom Place; 3 blocks to IRT subway)	high (access via West End Avenue; 4 blocks to Columbus Circle subway station)	high (access via 48th/49th Streets, Eleventh/Tenth Aves; 2.5 blocks to IND subway)	high (36th/37th Sts, Ninth/Tenth Aves; multiple transit facilities within a 2-block walk)
	ADA compliance	in compliance	in compliance	in compliance	in compliance	in compliance
	Effect on mainline services	minor	minor	minor	minor	minor
	Parking availability (abundant, sufficient, insufficient)	insufficient (minimal on-street parking)	insufficient (minimal on-street parking)	sufficient (adjacent parking lot)	sufficient (adjacent parking lots)	abundant (multiple private parking lots)

Notes for Table 10:

3. Coordination with the Riverside South Development Corporation necessary regarding station placement, design, and construction. Station would be below grade.
4. The open cut located at West 58th Street is small (half a block) and any construction north of West 59th Street would require excavation. Station would be below grade
5. This location is an open cut, making the station below grade.
6. The preferred station location is from West 36th to West 37th Streets, as the parcel adjacent to the Empire Connection right-of-way is vacant. The Empire Connection is single-tracked in this area, placed within a "washtub" track (see sketch):



Any station constructed within this portion of the Empire Connection would have to remove one side of the "washtub" and build a platform alongside the tracks, as the top of the concrete barrier is too high for placement of a platform over the top of the basin. See sketch:



Single tracking on the Empire Connection runs from south of 38th Street. North of that is double track till Inwood.

Table 11
Decision Matrix for Potential New Station Locations with Alternative 1: Weekday Hudson Line Service

Evaluation Measure	GWB (MP 8.01)	Columbia Med. Ctr. (MP 7.56)	West 138th (MP 5.94)	West 125th (MP 5.52)	West 116th (MP 4.81)	West 72nd (MP 2.65)	West 66th (MP 2.35)	West 59th (MP 2.0)	West 49th (MP 1.43)	Javits Ctr. MP 0.87
Total Ridership at New Station										
Net New Transit Trips										
Net change in MNR Ridership										
Order-of-Magnitude Construction Cost										
Property Acquisition										
Economic Development Potential										
Section 4(f) Issues										
Potential for disturbance of contaminants										
Conformance with design guidelines										
Ease of Station Access										
Effect on mainline services										
*Note: Amtrak Mileposts (MP) are provided in the column heading for each station										

Legend: Best Performing **Worst Performing**

As shown in Table 10, siting of this station would require taking of approximately two acres of Fort Washington Park, a protected resource subject to Section 4(f) requirements. While the station platforms could be situated within the Empire Connection right-of-way where the alignment traverses the park, it is not possible to provide access to the station without taking parkland. Section 4(f) precludes taking of public parkland for transportation use unless there is no prudent and feasible alternative to the action for which the taking is required. As documented above, there are other potential new station locations, e.g., West 125th Street that would avoid Section 4(f) resources and may also be considered prudent and feasible new-station alternatives to this location, for purposes of the proposed Penn Station access project. Therefore, this location will not be advanced for further study.

Ridership potential for Penn Station access service at this new station location (1,854,276 person-trips annually) is lower than the forecasts for four of the other eight station locations investigated along the alignment of Alternative 1 (see Table 10). Much of the trip volume to and from this station location would be new Metro-North ridership, including diversions from subway and bus services, as evidenced by the small number (567) of net new transit trips per year. However, the costs associated with this location are the highest of the eight investigated for Alternative 1. Within the physical constraints posed by the topography, roadway infrastructure, and parkland Section 4(f) resource at this location, a new station could be constructed at significant expense (see Table 10) but with some limitations. As neither vehicular nor pedestrian access is currently available to this location, both would have to be constructed. The station platforms have been defined as 4 rather than 6 car-lengths, although the longer is more desirable, because providing access to a longer platform would require greater parkland taking. As summarized in Table 11, this site performs poorly compared to most of the other new-station options for Alternative 1.

Columbia Presbyterian Medical Center Vicinity – A station with two side platforms of 4 car-lengths could be sited west of West 165th Street, but would unavoidably encroach on Fort Washington Park. Access to the station would be via a newly constructed extension of West 165th Street that would span the Henry Hudson Parkway, and approach the station at grade. Southbound passengers would use reach their platform via a newly constructed overpass from the northbound side. In compliance with ADA requirements, two elevators would be provided to accommodate use of the overpass.

As at the George Washington Bridge station location, a new station on the Empire Connection alignment in the vicinity of Columbia Presbyterian Medical Center would require taking of approximately two acres of Fort Washington Park, a protected resource subject to Section 4(f) requirements (see Table 10). The taking would be required for provision of access, which is currently unavailable to/from the site, to the station platforms. As there are prudent and feasible new-station alternatives, which would avoid Section 4(f) resources, this location will not be advanced for further consideration.

Ridership potential at this location (2,071,018 annual person-trips) is in the mid-range of the eight stations investigated while net increase in Metro-North ridership is the highest among the Hudson Line new-station locations evaluated. However, the estimated station construction cost (see Table 10) to provide service for this ridership is among the highest of the new-station options. Further, the platforms would be only 4 car-lengths as longer platforms would require additional Section 4(f) taking in Fort Washington Park for construction of the necessary overpass for access.

West 138th Street – A station with an island platform of 6 car-lengths could be constructed on a site just north of West 138th Street, one block west of Riverside Drive. Pedestrians would access the station platforms from the Riverbank State Park pedestrian bridge at West 138th Street via newly constructed stairwells and/or elevators, the latter of which would be required for ADA compliance.

As shown in Table 10, a new station at West 138th Street would attract ridership in the mid-range of the new-station options considered along the Hudson Line alternative's alignment, but with lower net new annual transit trips than the majority of stations (47,420 trips). The increase in Metro-North ridership (745,430 annually) forecast for a West 138th Street station also falls mid-range among the other stations considered. While this station site performs comparatively well against the non-ridership-related evaluation measures, the West 138th Street ridership potential does not warrant advancing it for further study. Some portion of its potential ridership may be served by a new station at West 125th Street, which is recommended to be advanced.

West 116th Street – A station with an island platform of 6 car-lengths could be sited west of West 116th Street, but would unavoidably encroach on Riverside Park. Pedestrian access to the station would be from West 116th Street from pathways within the park. The station would be below-grade; its placement and construction would have to be coordinated with the New York City Department of Parks and Recreation, as the railroad right-of-way is in tunnel within Riverside Park. Passenger access between the below-grade station platform and street level would be via newly constructed stairwells and/or an elevator, the latter for ADA compliance.

As shown in Table 10, West 116th Street is one of the three northern Manhattan new-station options that would affect a protected Section 4(f) resource, in this case Riverside Park, which is both a publicly owned parkland and a National Register landmark. As a direct result of this station site's location within Riverside Park, vehicular access to the station would have to be constructed. While ridership potential for Penn Station access service at this location falls in the mid-range of new-station options for Hudson Line Penn Station access service, there are other reasonable new-station options that avoid Section 4(f) resources (and a station at West 125th Street, which is recommended to be advanced for further study, may serve some portion of the West 116th Street ridership). Therefore, this site is not recommended for further study.

West 72nd Street – A station with an island platform of 6 car-lengths could be sited just south of West 72nd Street and one block west of West End Avenue. Pedestrian access to the station would be from West 72nd Street. The station would be below-grade; its placement and construction would have to be coordinated with the Riverside South Development, the northern buildings of which have already been constructed over the railroad right-of-way between West 72nd and 69th Streets. Passenger access between the below-grade station platform and street level would be via newly constructed stairwells and/or an elevator, the latter for ADA compliance.

Ridership forecasted for this location (1,774,048 annual person-trips) is lower than for five of the other seven new-station options evaluated for the base Hudson Line alternative (see Table 10). Similarly, the increment of new transit trips (54,053 annually) and total Metro-North ridership (729,895 trips per year) are at the low end and mid-range, respectively, among new-station options. The more modest ridership benefit achieved at this station is particularly noteworthy compared to the ridership forecast for a potential West 66th Street station (which will be advanced for further study; see above); also, a West 66th Street station could arguably serve some of the ridership otherwise attracted to this location. The cost for construction of a West 72nd Street station, while not high relative to some other station options (and the same as for West 66th Street) would be for lower ridership benefits. While construction of this station would have to be coordinated with the Riverside South Development Corporation, whose construction is ongoing above the rail right-of-way, it is further complicated by the fact that the Development project's restrictive declaration required space for a rail station between West 69th and 70th Streets and at West 59th Street, not at West 72nd. This location will not be advanced for further study due to its relatively modest performance compared to several other potential locations (see Table 11).

West 66th Street – A station with an island platform of 6 car-lengths could be sited south of West 66th Street and west of Freedom Place within the Riverside South Development complex. Access to the station would be from West 66th Street. The station would be below-grade, and its placement and construction would have to be coordinated with the ongoing, phased construction of the Riverside South Development over the railroad right-of-way. Passenger access between the below-grade station platform and street level would be via newly constructed stairwells and/or an elevator, the latter required for ADA compliance.

As shown in Table 10, ridership potential of a new station at West 66th Street is among the most robust of the new-station options considered along the Hudson Line alternative's alignment. However, among the new-station options in the West Midtown Manhattan area – i.e., five station sites between West 72nd Street and the Jacob Javits Convention Center vicinity – the ridership forecast for West 66th Street is modestly lower than that for West 59th Street, which performs best across all evaluation measures related to ridership potential (and has been recommended to be advanced for further study). For most of the other non-ridership-related evaluation measures used in the comparative screening of new-station options, West 66th Street also performs comparably to West 59th Street. However, West 66th Street is not recommended to be advanced for further study due to its proximity to the West 59th Street option, which may serve some of the ridership potential forecast for this station option.

West 49th Street – An island platform station could be sited in an open cut of the railroad right-of-way immediately south of West 49th Street and west of 10th Avenue. The platform would be only 4 car-lengths, as construction of a longer platform would require major structural support modifications. Pedestrian access to the below-grade station would be from West 49th and West 48th Streets, with access between the platform and street level via newly constructed stairwells and/or an elevator, the latter required for ADA compliance.

As shown in Table 10, the ridership forecast for this potential new station site is at the high end of the range for all station sites investigated, at 2,350,566 person-trips per year and 151,640 net new transit trips annually. However, the forecast increase in total annual Metro-North ridership (268,990) is markedly lower than at most of the other potential locations along the Hudson Line. The ridership potential at West 49th Street would result principally from diversions of Metro-North trips to/from Penn Station as well as Grand Central Terminal, compared to the base weekday Hudson Line service alternative. The West 49th Street location could accommodate a platform of only 4 car-lengths, as a more desirable 6-car-length platform would require modifications to the underpinning of West 48th Street, and incur associated additional construction costs. While this station site performs relatively well, compared to the other sites considered, for all construction-, environmental-, and siting-related evaluation measures (see Table 11), it is not recommended for further study due to its proximity to the West 59th Street option that will be advanced and may serve some of the ridership potential forecast for West 49th Street.

Jacob Javits Center Vicinity – A station with one side platform of 6 car-lengths could be sited in the open cut of the railroad right-of-way immediately south of West 37th Street and east of 11th Avenue. The track bed in this area limits this station site to a single-platform configuration. Pedestrian access to the below-grade station would be from West 37th and West 38th Streets, with access between the platform and street level via newly constructed stairwells and/or an elevator, the latter required for ADA compliance.

As shown in Table 10, a station located in the Convention Center vicinity for Penn Station access purposes would produce lower ridership benefits than any of the other West Side station options. The forecast ridership is only 589,408 annual person-trips that would be achieved at the expense of other transit services (annual loss of 16,225 bus and subway trips) and total Metro-North ridership (annual loss of 87,237 trips). This reduction in total Metro-North ridership reflects the negative impact of adding a third station and associated time delay without enough ridership at the new station to offset the loss of riders on the main line.

Notwithstanding the poor ridership performance displayed by this station in the context of this Study, potential development resulting from future planning efforts for this area could ultimately support a station at this location. As potential ridership benefits resulting from future development growth cannot be defined at this time for this Study, it is assumed that a new station in the Convention Center vicinity may be explored at a later date in a different context.

Station Utilization

Summary statistics on the directionality of travel during the AM peak period are provided below for the West 59th Street and West 125th Street new-station options that are recommended to be advanced for further study with weekday Hudson Line Penn Station access service. The AM peak-period station utilization evident in these forecasts is that West 59th and West 125th Streets would serve principally as destinations, rather than departure points. Station utilization will be evaluated in detail in the next Study phase to further define the ridership benefits for the commute and reverse-commute travel markets.

Directionality of Travel at Stations Advanced

New Station	AM Peak-Period Ridership *To* New Station			AM Peak-Period Ridership *From* New Station		
	Total Volume	From North	From South	Total Volume	Northbound	Southbound
West 125th Street	1,213	62%	38%	304	63%	37%
West 59th Street	3,244	36%	64%	530	50%	50%

Note: Assumes 5 trains per hour per direction during the AM peak-period.

2b. Locations along Alternative 2: New Haven/Hell Gate Line Alignment

Station Options Advanced for Further Study

Ridership potential at each of the station options was forecast independently of consideration of any other new-station locations, in order to clearly distinguish each station's ridership potential, in both existing and new market areas. The combination of new stations at Hunts Point, Parkchester, and Co-op City, situated south to north along the New Haven/Hell Gate Line alignment for Alternative 2, is reasonably spaced for Penn Station access purposes, each approximately 2.5 miles from the nearest other new-station option (i.e., 2.42 miles between Hunts Point and Parkchester, and 2.44 miles between Parkchester and Co-op City). In addition, each of these three stations would serve some portion of the ridership potential forecast for other, nearby new-station options considered: Hunts Point would serve the Westchester Avenue market area; Parkchester, the Bronx Medical area; and Co-op City, the Pelham Parkway area.

Co-op City – A station with an island platform of 6 car-lengths could be sited in the railroad right-of-way east of Erskine Place and Boller Avenue, in Section 5 of Co-op City. Access to the at-grade station would be from Erskine Place at Boller Avenue, via a newly constructed overpass above the railroad right-of-way (using stairwells and/or an elevator, the latter required for ADA compliance). Some catenary and track relocation would also be required to accommodate the island platform.

The ridership potential at a new station at Co-op City is relatively robust, compared to the nine other new-station locations investigated along the alignment of Alternative 2 (see Table 12). This site performs well in terms of station-specific ridership (1,046,137 person-trips annually) and new transit trips (277,238

annually). The forecast increase in Metro-North ridership (455,038 trips per year) is mid-range among the station sites investigated. This ridership potential is forecast for a new station that could be constructed for cost at the low end of the range of costs among the new-station options. The moderate rating for economic development potential reflects planned expansion of the commercial base in the Co-op City area that serves a more regional market, including construction of a new mall on a 21-acre site adjacent to Bay Plaza. This station location also performs well, compared to all other station options, for construction-related, environmental, and site access considerations, as well as conformance with Metro-North's new-station siting and design guidelines.

Parkchester – A station with an island platform of 6 car-lengths could be sited in the railroad right-of-way north of Unionport Road and west of Tremont Avenue East. Access to the below-grade station would be from the west side of Tremont Avenue East. Stairwells and an elevator would be constructed to provide passenger access between the below-grade platform and street level.

As shown in Table 12, a new station at Parkchester shows the second highest ridership potential among the potential station sites evaluated on the New Haven Line, with 1,387,038 person-trips per year. This would increase Metro-North's total annual ridership by 936,123 trips, the greatest net increase among the 10 station options. This latter statistic is more than 20 percent higher than the second highest forecast increase in Metro-North ridership (at Hunts Point). A Parkchester station would also result in 245,097 annual new transit trips, also among the highest for the sites investigated. Construction of this new station is estimated at the low end of the range of new-station cost estimates, and could be accomplished with little construction difficulty. While the site has moderate potential for on-site contamination and traffic congestion in the station's vicinity would be a consideration (see Table 12), the Parkchester site performs well for the evaluation measures that best differentiate among the 10 new-station options for Alternative 2: Weekday New Haven Line Service (see Table 13).

Hunts Point – A station with an island platform of 6 car-lengths could be sited in the railroad right-of-way south of Hunts Point Avenue and east of the Bruckner Expressway. Access to the below-grade station would be from the south side of Hunts Point Avenue. Passengers would use newly constructed stairwells and/or an elevator, provided in compliance with ADA requirements, to reach the platform. Some catenary and track relocation would be necessary to accommodate the island platform. While a former rail station still stands on the north side of Hunts Point Avenue could potentially be acquired and rehabilitated, an island-platform station was defined for this comparative screening, consistent with the set of station characteristics used for the other potential station locations.

The ridership forecast for a new station at Hunts Point is the highest (1,523,391 annual person-trips) among the 10 new stations evaluated (see Table 12). It also performs fairly well, compared to the other station options, in terms of new transit trips (207,864 annually). A new Hunts Point station would also yield a robust increase in Metro-North ridership (774,484 annually), with only one other potential new station (Parkchester) on the New Haven Line forecast to have even greater Metro-North increases. The Hunts Point ridership potential is forecast for a new station that could be constructed at the low end of the range of new-station cost estimates.

Home to the Hunts Point Cooperative Market, a major wholesale food distribution center under the jurisdiction of the New York City Economic Development Corporation, Hunts Point was designated in 1994 as part of an Economic Development Zone that also includes Port Morris, Mott Haven and Highbridge. Created to stimulate economic growth, the designation makes a variety of financial incentives available, designed to attract new businesses and assist existing enterprises to expand and increase employment in the area. In addition to publicly sponsored economic development activities

(e.g., relocation of the Fulton Fish Market's activities to the Hunts Point peninsula), several well-established as well as recently emerging not-for-profit organizations work to champion and support economic development opportunities in Hunts Point. As shown in Table 13, a new station at Hunts Point would serve to support the economic development potential of the area, in addition to performing very favorably for most of the evaluation measures that best differentiate among the new-station options for Alternative 2.

Station Utilization

Summary statistics are provided below on the directionality of travel during the AM peak period at the Co-op City, Parkchester, and Hunts Point new-station options that are recommended to be advanced for further study with the weekday New Haven Line Penn Station access service. The AM peak-period station utilization evident in these forecasts is that these stations would serve principally as departure points for more northerly destinations, rather than as destinations. Station utilization will be evaluated in detail in the next Study phase to further define the ridership benefits for the commute and reverse-commute travel markets.

Directionality of Travel at Stations Advanced

New Station	AM Peak-Period Ridership *To* New Station			AM Peak-Period Ridership *From* New Station		
	Total Volume	From North	From South	Total Volume	Northbound	Southbound
Co-op City	105	43%	57%	1,398	82%	18%
Parkchester	140	71%	29%	1,853	69%	31%
Hunts Point	459	29%	71%	1,730	92%	8%

Note: Assumes 5 trains per hour per direction during the AM peak-period.

Table 12
Comparative Screening Results of Potential New Station Locations Along Alignment of Alternative 2: New Haven Line/Hell Gate Line

Screening Criteria	Evaluation Measures	Pelham Manor[1]	City Island Pelham Bay Park[2]	Co-op City[3]	Pelham Parkway[1]	Bronx Medical Center[4]
A new station should enhance an alternative's transit ridership potential.	Potential ridership (no. of person-trips) for the station AM peak hour AM peak period Annual (2020)	 929 1,881 1,308,856	 208 421 293,106	 743 1,503 1,046,137	 771 1,562 1,086,853	 803 1,625 1,131,223
	New transit trips per year (2020) due to new station	78,722	(41,207)	277,238	310,618	54,835
	Total net change in Metro-North ridership due to new station, in person-trips over base intermediate alternative's number of trips per year (2020)	270,292	(9,156)	455,038	636,147	694,577
A new station should be capable of being constructed without extraordinary techniques or cost, and should minimize conflicts with existing transportation services.	Degree of construction complexity (high, medium, or low) due to site conditions	medium (residential neighborhood)	medium (parklands)	Low	low	Low
	Order-of-magnitude initial capital cost of new station construction (in year 2000 dollars)	medium ($10 – 20 million, 6 car-lengths, 2 side platforms, overpass, 2 elevators)	medium ($10 – 20 million, 6 car-lengths, 2 side platforms, overpass, 2 elevators)	low ($1 – 10 million, 6 car-lengths, island platform, catenary/third-track relocation, overpass, 2 elevators)	medium ($10-20 million6 car-lengths, 2 side platforms, overpass, 2 elevators)	low ($1 – 10 million, 6 car-lengths, island platform, catenary/third-track relocation, overpass, 2 elevators)
	Potential for disruption of existing services (high, medium, or low)	low	low	Low	low	Low
new station should minimize adverse social, economic and environmental impacts.	Economic development potential	low	low	moderate	low	moderate
	Number of properties to potentially be acquired or displaced	1	1	none	none	1
	Section 4(f) resources potentially taken	none	2 acres (wildlife refuge); (catenary structure may be considered historic)	none (catenary structures may be considered historic)	none (catenary structures may be considered historic)	none (catenary structures may be considered historic)
	Estimated acreage of wetlands potentially taken	none	none	none	none	none
	Number of contaminated sites potentially disturbed	none	none	none	none	6 (PCBs; moderate contamination)
	Degree (major, moderate, minor) of existing and potential future traffic congestion near station access points	major (only Pelhamdale Avenue for access)	moderate (parkway extensions are only roadways for access)	moderate (Hunter Ave to Boller Ave and Erskine Place are primary means of access)	major (access from Pelham Parkway overpass, which is very heavily traveled)	major (access via Morris Park Ave. -- Wilkinson also possible -- and Basset Ave., which are heavily congested)
Siting and design of a new station should be in conformance with Metro-North's station guidelines and standards, to the maximum extent possible.	Conformance with platform height, location, dimension, and access and guidance	no transit access (platform could be longer if desired)	no transit access (platform could be longer if desired)	in conformance (platform could be longer if desired)	Parkway is only adjacent road, with one bus route (platform could be longer if desired)	in conformance (platform could be longer if desired)
	Ease of station access (high, medium, low) for pedestrians, taxis/autos, and buses	low for pedestrians; low for vehicles (only 1 minor street)	low for pedestrians (closest residential community is at least 1 mile away) and vehicles	high for vehicles (4 bus routes terminate in vicinity), medium for pedestrians (have to cross a parkway)	low for pedestrians (must walk along Pelham Parkway); high for vehicles	high for pedestrians (one block from complex, 2 bus routes) medium for vehicles (due to congestion)
	ADA compliance	in compliance	in compliance	in compliance	in compliance	in compliance
	Effect on mainline services	minor	minor	minor	minor	minor
	Parking availability (abundant, sufficient, insufficient)	insufficient (residential neighborhood)	insufficient (no parking)	sufficient (adjacent parking structure)	insufficient (no parking)	insufficient (on-street only)

Notes for Table 12:

1. Station would be at grade.
2. Former Bartow Station for City Island was located here. Station would be at grade.
3. Preferred station site is adjacent to Hunter/Boller Avenues as buses in the community terminate there. Station would be at grade.
4. Former Farberware plant is adjacent to the right-of-way location preferred for this station. Adjacent land uses are privately owned industrial/auto uses, which makes access to the station pedestrian-unfriendly.
5. A former Hartford and New Haven Railroad platform (dilapidated) exists here. Connection from Unionport Road would require high fencing for passenger protection from catenary lines. Access to station would be below grade

(Page 1 of 2)

Table 12 (cont'd)
Comparative Screening Results of Potential New Station Locations Along Alignment of Alternative 2: New Haven Line/Hell Gate Line

Screening Criteria	Evaluation Measures	Parkchester[5]	Westchester Av.[6]	Hunts Point[7]	Astoria[8]	Sunnyside[9]
A new station should enhance an alternative's transit ridership potential.	Potential ridership (no. of person-trips) for the station					
	AM peak hour	984	911	1,081	220	325
	AM peak period	1993	1,844	2,189	446	659
	Annual (2020)	1,387,038	1,283,612	1,523,391	310,367	458,434
	New transit trips per year (2020) due to new station	245,097	108,490	207,864	(98,318)	(36,325)
	Total net change in Metro-North ridership due to new station, in person-trips over base intermediate alternative's number of trips per year (2020)	936,123	634,171	774,484	223,339	196,192
A new station should be capable of being constructed without extraordinary techniques or cost, and should minimize conflicts with existing transportation services.	Degree of construction complexity (high, medium, or low) due to site conditions	low	Low	low	high (elevated viaduct, major structural issues)	high (construction in Sunnyside yards, amongst LIRR main line tracks)
	Order-of-magnitude initial capital cost of new station construction (in year 2000 dollars)	low ($1 – 10 million, 6 car-lengths, island platform, one elevator)	low ($1 – 10 million, 6 car-lengths, island platform, one elevator)	low ($1 – 10 million, 6 car-lengths, island platform, catenary/third-track relocation, one elevator)	high ($20+ million, 4 car-lengths, 2 side platforms, structural support modifications, connection to existing BMT subway line, 2 elevators)	N/A (construction assumed as cost of LIRR East Side Access project)
	Potential for disruption of existing services (high, medium, or low)	low	Low	low	medium (construction staging in 31st St., below)	medium (construction in Sunnyside yard, amongst LIRR main line tracks)
A new station should minimize adverse social, economic and environmental impacts.	Economic development potential	low	Moderate	high	low	high
	Number of properties to potentially be acquired or displaced	none	None	none	none, if using BMT access points, otherwise 1 minimum	none
	Section 4(f) resources potentially taken	none (catenary structures may be considered historic)	None	none (catenary structures may be considered historic)	Hells Gate Bridge approaches and concrete arch are on the National Register (catenary structures may be considered historic)	none
	Estimated acreage of wetlands potentially taken	none	None	none	none	none
	Number of contaminated sites potentially disturbed	5 or more (PCBs; moderate contamination)	3 or more (PCBs, pesticides, historic fill; moderate contamination)	3 or more (PCBs; moderate contamination)	none	1 (PCBs, pesticides; high contamination)
	Degree (major, moderate, minor) of existing and potential future traffic congestion near station access points	moderate (station access from Unionport Road bridge)	moderate (station access from Westchester Avenue)	moderate (station access would conflict with heavy traffic flow on Hunts Point Ave.)	moderate	moderate (Queens Boulevard is very heavily traveled)
Siting and design of a new station should be in conformance with Metro-North's station guidelines and standards, to the maximum extent possible.	Conformance with platform height, location, dimension, and access and guidance	in conformance (platform could be longer if desired)	in conformance (platform could be longer if desired)	in conformance (platform could be longer if desired)	cannot accommodate 6 car-length platform	in conformance
	Ease of station access (high, medium, low) for pedestrians, taxis/autos, and buses	high for pedestrians (4 bus routes), medium for vehicles (no standing permitted)	high for pedestrians (2 bus routes with adjacent stop, IRT Whitlock Ave station), medium for vehicles (no standing permitted)	medium for pedestrians (have to cross Bruckner Boulevard) and vehicles (no standing permitted)	high for pedestrians, medium for vehicles (due to congestion)	high for all (Queens Boulevard for vehicles, numerous transit facilities for pedestrians located within one block)
	ADA compliance	in compliance	in compliance	in compliance	in compliance	in compliance
	Effect on mainline services	minor	minor	minor	minor	major
	Parking availability (abundant, sufficient, insufficient)	insufficient (on-street only)	insufficient (on-street only)	abundant (under Bruckner expressway)	insufficient (adjacent lots are heavily used, some on-street)	insufficient (on-street only)

Notes for Table 12:

6 A former Hartford and New Haven Railroad station (dilapidated) exists here. Access to station would be below grade. Edgewater Road (immediately east of right-of-way) is slated to be converted to a park by New York City (fencing and park signs in place).

7 A former Amtrak station building exists here. Access to right-of-way is limited by privately own parcels, and is below grade.

8 Structural condition of entire viaduct may increase cost of this station, as viaduct should be replaced. Shared access with the BMT subway line.

9 This station's design is per the Draft Environmental Impact Statement (DEIS) of the MTA/LIRR's East Side Access Project. Access to station would be below grade

Table 13
Decision Matrix for Potential New Station Locations with Alternative 2: New Haven Line

Evaluation Measure	Pelham Manor (MP 17.87)	City Island (MP 16.28)	Co-Op City (MP 15.2)	Pel. Pkwy. (MP 14.71)	Bronx Med. (MP 14.02)	Parkch-ester (MP 12.78)	Westch-ester (MP 11.28)	Hunts Point (MP 10.62)	Astoria (MP 6.52)	Sunny-side (MP 3.31)
Total Ridership at New Station										
Net New Transit Trips										
Net change in MNR Ridership										
Order-of- Magnitude Construction Cost										
Property Acquisition										
Economic Development Potential										
Section 4(f) Issues										
Potential for disturbance of contaminants										
Conformance with design guidelines										
Ease of Station Access										
Effect on mainline services										

Note: Amtrak Mileposts (MP) are provided in the column heading for each station.

Legend: Best Performing ⟶ **Worst Performing**

Station Options Not Advanced for Further Study

Pelham Manor – A station with two side platforms of 6 car-lengths could be constructed in the railroad right-of-way adjacent to Pelhamdale Avenue. Access to the eastbound side of the station would be from Manor Circle and Pelhamdale Avenue, and would be at-grade. Westbound passengers would approach their platform via a newly constructed overpass from the eastbound side of the station, using stairwells and/or an elevator, the latter required for ADA compliance.

As shown in Table 12, this new station would attract a relatively robust patronage (1,308,856 annual person-trips) compared to other new-station sites investigated. However, it would not perform as well in terms of new transit trips (78,722 annually) and Metro-North ridership increase (270,292 trips per year), compared to the best-performing station locations. While the estimated cost of construction of this new station is in the mid-range of new- station options, site design and access are problematic. The only vehicular access to the site is from Pelhamdale Avenue, a relatively minor street. There is no transit access to the station site and parking would need to be constructed to serve the station's suburban-like setting, as no parking is currently available in the site's vicinity. Given the relatively high construction cost and inadequate site access without achieving the best ridership potential, compared to other sites, Pelham Manor is not recommended to be advanced for further study.

City Island/Pelham Bay Park – A station with two side platforms of 6 car-lengths could be sited in the railroad right-of-way south of the Hutchinson River Parkway Extension and west of Pelham Bridge Road (Shore Road), on the site of the former Bartow Station of the Hudson and New Haven Railroad. The station would unavoidably be located within Pelham Bay Park, through which the Hell Gate Line traverses. Access to the new station's eastbound platform would be from Shore Road, and would be at-grade. Passengers traveling westbound would use a newly constructed overpass to reach the westbound platform from Shore Road. ADA compliance would require construction of elevators for access to and from the overpass.

As shown in Table 12, the ridership forecast for a new station near City Island, situated within the Hell Gate right-of-way traversing Pelham Bay Park, is the lowest of all station options investigated: 293,106 annual person-trips at the new station; a loss of 41,207 transit trips; and a loss of 9,156 trips in annual Metro-North ridership. This location also performs poorly in terms of Metro-North's new-station siting and design guidelines. Construction of a new station in Pelham Bay Park would require taking of approximately two acres of wildlife refuge, a Section 4(f)-protected resource. As there are several prudent and feasible alternative new-station options for purposes of improved Penn Station access, this station site will not be advanced for further study.

Pelham Parkway – A station with an island platform of 6 car-lengths could be sited in the railroad right-of-way north of Pelham Parkway. Access to the below-grade station would be from the north-side sidewalk of the Pelham Parkway overpass above the rail right-of-way. From the parkway overpass, passengers would use newly constructed stairwells and/or elevators, provided in compliance with ADA requirements, to reach the platform.

Ridership potential at this new station location falls mid-range among the options investigated, with 1,086,853 person-trips per year (see Table 12). It would produce the highest number of new transit trips (310,618 per year), given the paucity of transit services currently available in this area, and mid-range among the increases in annual Metro-North ridership (636,147). However, the site's location is problematic in that both pedestrian and vehicular access are difficult, achieved via Pelham Parkway, a busy thoroughfare. While there is a sidewalk on either side of the parkway's traffic lanes, there may be some cause for concern about pedestrian safety as pedestrian flows would presumably increase substantially with introduction of a new station here. Construction of this station would be towards the middle of the range for new station sites

investigated for Alternative 2. Despite this station's forecast ridership benefits, it is recommended that it not be advanced for further study, both because access to the site is problematic, and because the Co-op City site, which is about one-half mile from this potential station site, has both easy access and available parking that could accommodate some of the ridership forecast for this site.

Bronx Medical Center – A station with an island platform of 6 car-lengths could be constructed in the railroad right-of-way east of Morris Park Avenue and Basset Avenue. Access to the station would be from Basset Avenue via a newly constructed overpass connecting to the station platform. Stairwells and/or elevators would be provided, in compliance with ADA requirements, for passenger use of the overpass leading to the platform. Some catenary and track relocation would be necessary to accommodate the island platform.

As shown in Table 12, a new station at this location would attract ridership (1,131,223 person-trips per year) in the mid-range of the 10 station options investigated and among the highest net increases (694,577 annually) in total Metro-North ridership per year. The number of new transit riders would be considerably less here (54,835 per year) than at six of the other station sites considered, including those that will be advanced for further study because of their overall positive performance against all evaluation measures. The estimated construction cost of this station is in the low range among the nine evaluated along the Hell Gate Line alignment. While pedestrian access to this station site is good, vehicles approaching or leaving the site will have to contend with fairly heavy congestion on Morris Park and Basset Avenues, the principal access routes, and there is insufficient parking available, limited to on-street opportunities. Compared to the other potential new-station locations considered for Alternative 2., it is recommended that the Bronx Medical Center station not be advanced for further study, as there are others that perform uniformly better.

Westchester Avenue – A station with an island platform of 6 car-lengths could be constructed in the railroad right-of-way south of Westchester Avenue and east of the Sheridan Expressway. Access to the below-grade station would be from the south side of Westchester Avenue. Passengers would use newly constructed stairwells and/or an elevator to reach the platform. While it may also be feasible to rehabilitate the former Hartford and New Haven Railroad station building that still stands just north of the identified new station location, an island-platform station was defined for purposes of the comparative screening, consistent with the set of station characteristics used for the other potential locations.

As shown in Table 12, the ridership potential at a Westchester Avenue station (1,283,612 person-trips annually) is forecast at the higher end of the range for the ten stations investigated for Alternative 2. However, it is lower for all ridership-related measures than are forecast for the Hunts Point station option, which is located less than one-half mile from this potential station site and could, therefore, attract riders from the Westchester Avenue vicinity. While the increase in annual Metro-North ridership (634,141 trips) at Westchester Avenue is also at the higher end of the range for all station sites evaluated, the number of new transit trips (108,490 per year) would be about half that forecast for the three stations advanced for further study with Alternative 2. The Westchester Avenue site performs comparably to the nearby Hunts Point station site for most of the non-ridership-related evaluation measures but, as its ridership performance is less robust, it is not recommended for further study. While some development activity is proposed in the Westchester Avenue vicinity -- e.g., the New York City Department of Parks and Recreation has applied to have Edgewater Road, immediately to the east of the railroad right-of-way, demapped and combined with the vacant land adjacent to the Bronx River to create a new Hunts Point Riverside Park, as part of the City's plan for a continuous Bronx River greenway -- the ridership potential forecast for a Westchester Avenue site could be accommodated to a great extent at a new Hunts Point station, given the proximity of the two locations.

Astoria – A station with two side platforms of 4 car-lengths could be located directly adjacent to the current BMT Subway line station at Ditmars Boulevard and 31st Street in Astoria. This station's placement on an elevated portion of track limits the feasible platform length. Access to the station would be from the existing subway station entrances on Ditmars Boulevard or 31st Street. Passenger access to the platforms would be via newly constructed elevators or stairwells from within the BMT subway station complex. Structural support modifications to the existing station would also be required.

A new station for Penn Station access purposes would result in a net annual loss in transit ridership of 98,318 trips, while attracting only 310,367 person-trips per year to the station (see Table 12). It would also increase total annual Metro-North ridership by only 223,339 trips, among the worst showings of the ten station locations evaluated. In addition, the estimated construction cost for the Astoria station is the highest of the nine sites considered along Alternative 2's alignment. The Hells Gate Bridge approaches and concrete arch, which would be involved in construction of this new station, are National Register landmarks, further diminishing the attractiveness of this site. Due to its overall poor performance in the comparative screen, this station site will not be advanced for further consideration.

Sunnyside Yard – A new station in Sunnyside Yard was assumed to be as designed for the LIRR's East Side Access (ESA) project (as documented in that project's EIS), with both an island and two side platforms of 12 car-lengths within the Sunnyside Yard complex. It is to be immediately west of Queens Boulevard, beneath the Queens Boulevard overgrade bridge on the LIRR/Amtrak Main Line, and west of Harold Interlocking and east of the tunnel portals. Access to the station would be from the west side of Queens Boulevard and directly over the island platform. Passenger access between all platforms and the main station building would be provided via stairwells and elevators. As the East Side Access project is programmed and committed (it is to be constructed in the last of the ESA project's five-stage construction plan, near 2011), it has been assumed for purposes of this comparative screen that the new station in Sunnyside Yard will be constructed independent of this Study. Therefore, no cost was assumed in this Study for purposes of a Metro-North Penn Station access station at Sunnyside Yard.

Efficient flow of trains through Sunnyside Yard is vital to the smooth operation of LIRR and Amtrak, and any train service -- such as Metro-North Penn Station access service -- stopping on certain of the Yard's tracks would risk conflicting with the existing operators' routing strategies and operating plans. Therefore, accommodation of Metro-North Penn Station-bound trains at the ESA station at Sunnyside Yard would potentially require additional features beyond current designs.

As shown in Table 12, this location would increase Metro-North's annual total ridership by 196,192 trips and generate 458,434 trips per year at this station. However, these numbers represent a ridership potential that is among the lowest of the ten stations evaluated and would be achieved at the expense of other transit services (annual loss of 36,325 bus and subway trips). Notwithstanding the poor ridership performance displayed by this station in the context of this Study, potential development resulting from future planning efforts for this area may ultimately support a new station. As potential ridership benefits resulting from future development growth cannot be defined at this time for this Study, it is assumed that introduction of a new station at this location may be explored at a later date in a different context.

3. New Station Locations Eliminated Prior to Comparative Screening

The following new station locations suggested during the Study's scoping process were not put through the comparative screening for the reasons cited below:

- Enlarged Tarrytown Station at base of Tappan Zee Bridge. This suggestion was not investigated in the full comparative analysis because Tarrytown is already served by a Metro-North station. Ridership forecasts in the next phase of alternatives development and evaluation will be based on refined service plans defined for the Penn Station access alternatives advancing to the final, detailed phase. Should those forecasts indicate the need for a larger, or additional, Tarrytown Station to accommodate increased ridership resulting in the future with Penn Station access service, the appropriate size and location of such a station will be investigated.
- Woodside, to connect to LIRR Woodside Station. The Hell Gate Line alignment, which would be used for New Haven Line service to Penn Station, veers westward and away from the LIRR Main Line, on which the LIRR Woodside station is located. The distance between a new station sited on the Hell Gate Line and Woodside Station on the LIRR Main Line precludes convenient connection between them, and would not likely result in travel time savings for passengers using the Penn Station access service. This would also require construction of the track connection, increasing the cost of station implementation.
- Yankee Stadium. Metro-North is investigating the feasibility, costs, and benefits of providing a station near Yankee Stadium for purposes other than improved Penn Station access. Therefore, this potential station location was not investigated in this comparative screening.

E. NEXT STEPS

Four Penn Station access alternatives and five potential new-station locations will undergo detailed engineering and operations-related definition and evaluation, and comprehensive environmental scrutiny. The relative ridership potential and other benefits, operations effects, costs and cost-effectiveness, and potential impacts of implementing weekday, off-peak/weekend, or combined services, will be investigated in detail and documented in the Penn Station Access MIS/DEIS to provide the basis for selection of a locally preferred alternative.

The alternatives and their respective station options that will be advanced are:

Alternative	Potential New Station
Alternative 1: Weekday Hudson Line Service via Empire Connection	West 59th Street West 125th Street
Alternative 1A: Off-Peak/Weekend Hudson Line Service via Empire Connection	None
Alternative 2: Weekday New Haven Line Service via Hell Gate Line	Co-op City Parkchester Hunts Point
Alternative 2A: Off-Peak/Weekend New Haven Line Service via Hell Gate Line	None

The technical work will be guided by a series of methodology reports addressing operations planning and analysis; ridership forecast modeling; capital and operations and maintenance cost estimating; and assessment of social, economic, and environmental impacts.

Detailed service plans for each of the advanced alternatives will be developed in the next phase with consideration of existing and forecast capacity constraints in the Penn Station complex and along the alternatives' full alignments. This will be accomplished using an operations planning model developed for this Study and based, in part, on data and information provided by the current operators in Penn Station. Detailed ridership forecasting will be conducted using the Regional Transit Forecasting Model, which will be refined in several aspects pertinent to the Metro-North service territory and to directly model the off-peak/weekend Alternative's 1A and 2A. Operations analyses and ridership forecasting will be an iterative process to define the highest ridership potential for each alternative, and address issues related to capacity constraints and operations both in Penn Station and along the rail alignments.

The next, detailed phase of the Study will be accompanied by ongoing public outreach and interagency coordination activities, including meetings of the Study's Technical Advisory and Community Liaison Committees; local community meetings; publication and distribution of Fact Sheets and newsletters; continuation of the Study's 24-hour telephone hotline; and updating of the Study web page with new information, completed Study documents, and announcements of specific opportunities for public input to the Study. Completion of the Metro-North Penn Station Access Study is anticipated in Fall 2002.

APPENDIX A:

STUDY GOALS AND OBJECTIVES

Goal 1: Provide improved access for existing Metro-North customers between Metro-North's service area and the West Side of Manhattan and, from there, to other regional destinations.

Objectives:

- Reduce travel times to destinations on the West Side of Manhattan for daily commuters and excursion travelers.
- Reduce the need for transfers between Metro-North service and other modes for commutation from the Metro-North service area to West Side destinations.
- Provide improved reverse (outbound) service from Manhattan and the Bronx and/or Queens to selected destinations in the Metro-North service area.
- Provide convenient connection and potentially one-seat service from the Metro-North service area to Amtrak, LIRR, and NJT service at Penn Station for travel to regional destinations outside the Metro-North service area.

Goal 2: Provide additional transportation options and increased flexibility and connectivity in the New York Metropolitan area's transportation network.

Objectives:

- Provide direct commuter service from the Metro-North service area to destinations on the West Side of Manhattan.
- Provide service between the Metro-North service area and the West Side of Manhattan for discretionary and intermediate travel.
- Provide increased flexibility for commutation between the Metro-North service area and Manhattan destinations during service disruptions.
- Provide additional Metro-North system capacity to accommodate potential future ridership growth.
- Provide improved connections between the Metro-North service area and LIRR, NJT, Amtrak, and NYC Transit services at and near Penn Station.
- Provide a new station(s), in Manhattan, the Bronx, and/or Queens, as intermediate stop(s) between the Metro-North service area and Penn Station.

Goal 3: Provide cost-effective transportation improvements that can be implemented while minimizing adverse social, economic, and environmental effects.

Objectives:

- Maximize the use of existing rail infrastructure to improve connections between the Metro-North service area and the Penn Station area and West Side of Manhattan, and to provide service to areas not currently served by Metro-North.
- Identify transportation improvements that would minimize acquisition of property or displacement of residential, business, and other viable uses.
- Identify transportation improvements whose construction and operations impacts could be reasonably and cost-effectively mitigated, as appropriate.

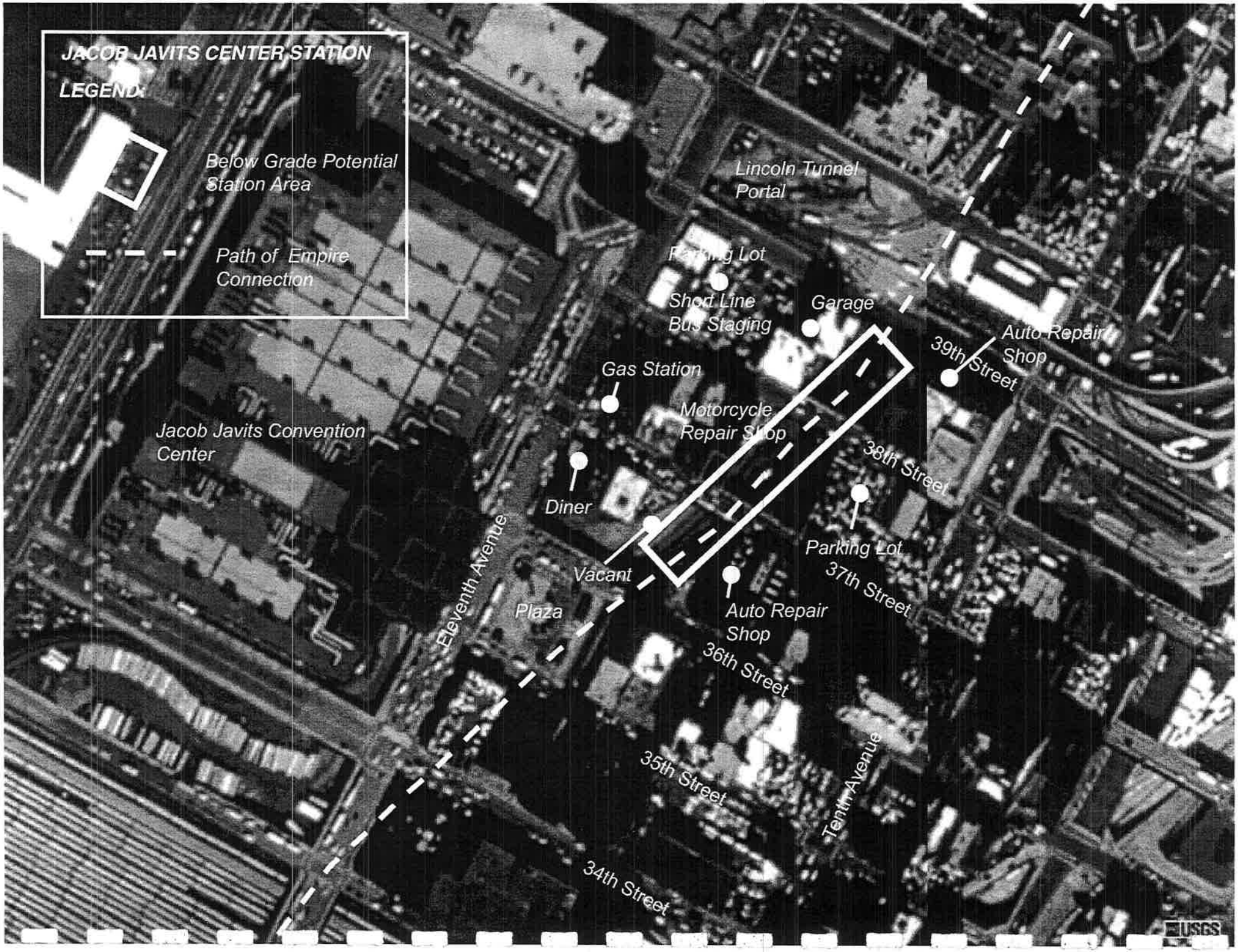
Goal 4: Promote the economic and environmental health and vitality of the New York Metropolitan area.

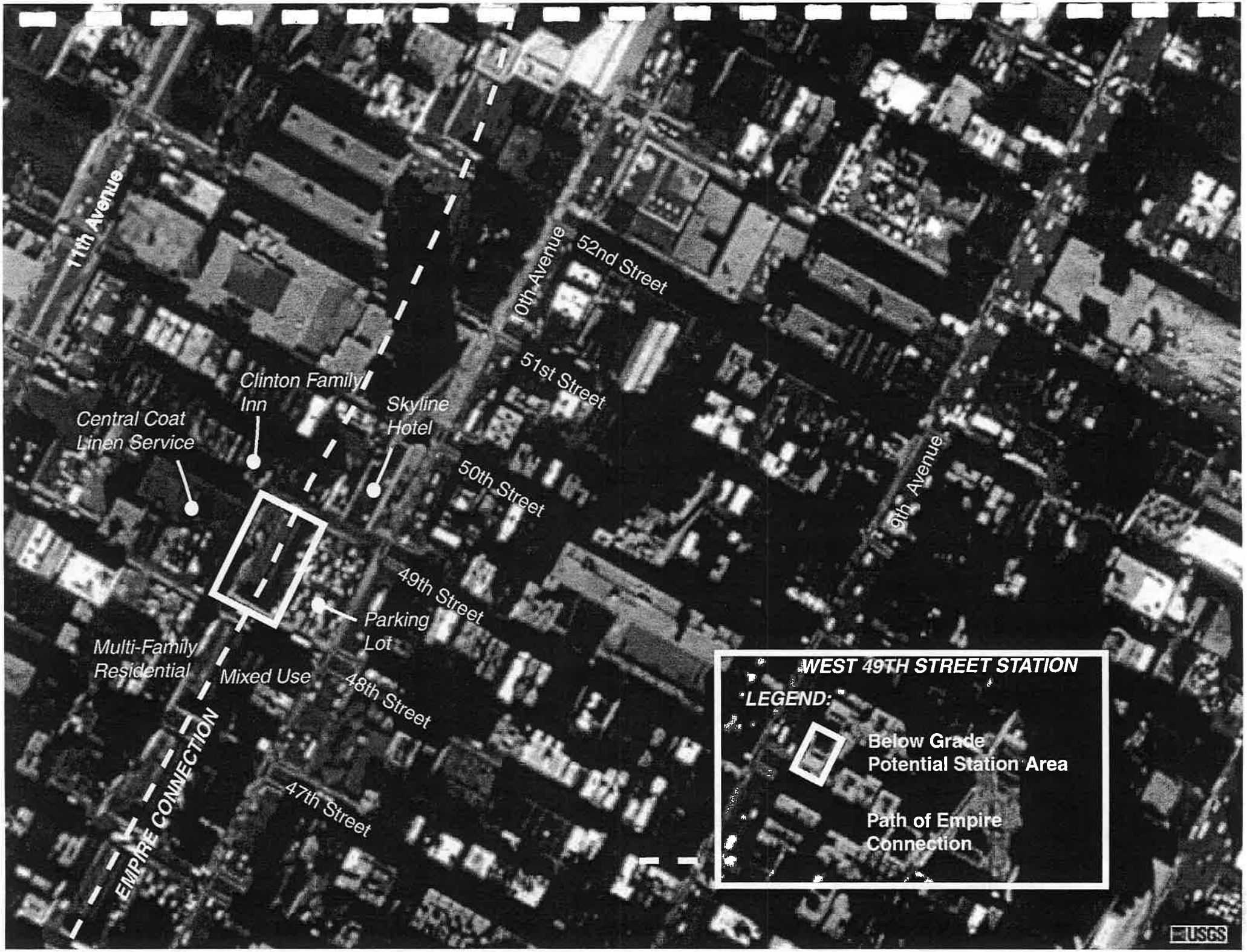
Objectives:

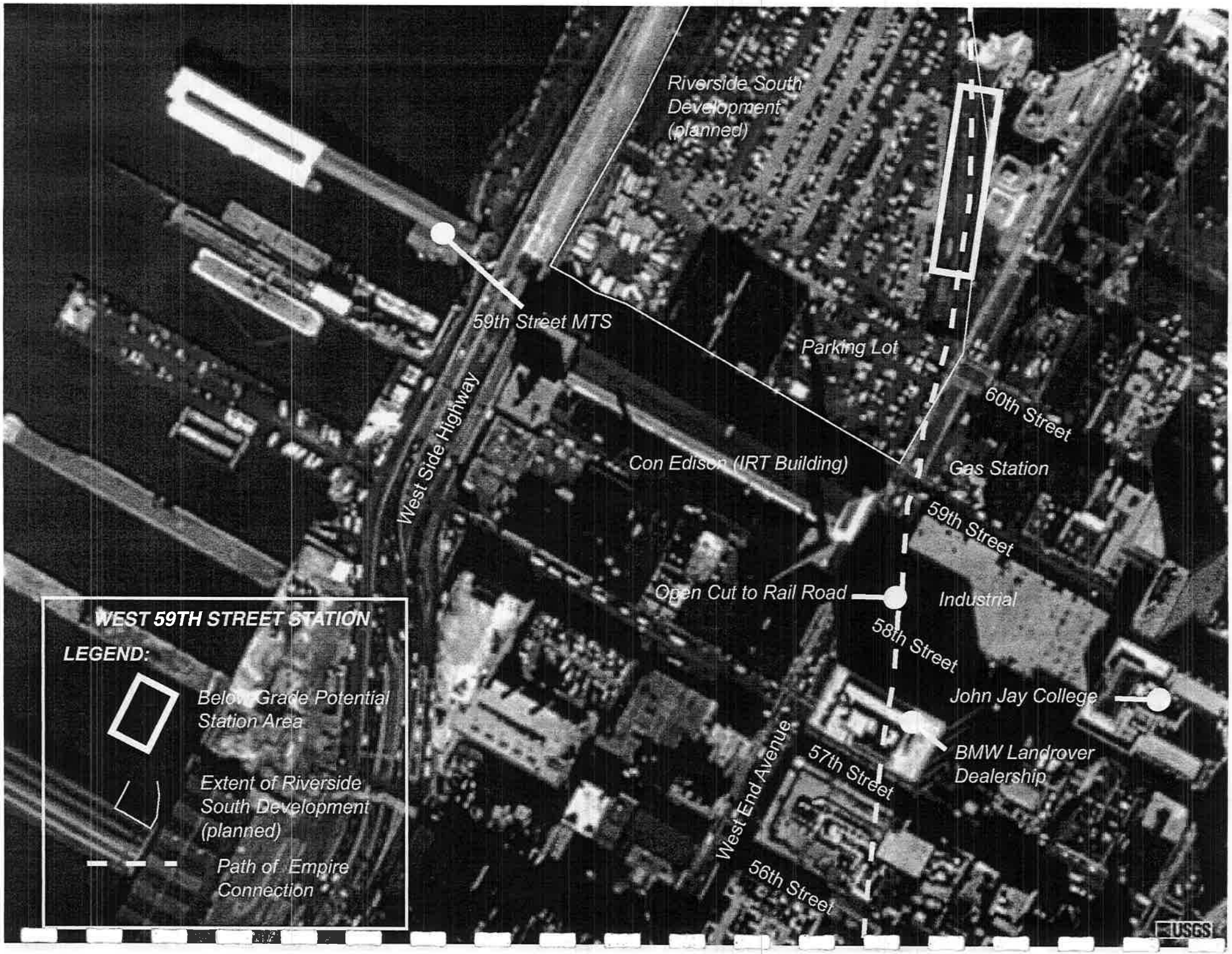
- Provide improved commuter accessibility from the Metro-North service area to employment locations on the West Side of Manhattan.
- Provide improved rail service options that encourage modal shifts from single-occupant-vehicle travel and thereby reduce traffic congestion on the region's roadway network and improve regional air quality.
- Provide transportation improvements that will comply with Clean Air Act Amendments of 1990 and State Implementation Plan provisions.
- Attract new ridership to mass transit.
- Identify transportation improvements for which there is a very reasonable chance that federal, state, and/or local funding will be available for implementation.
- Support local and regional economic growth by improving mobility in the study area.

APPENDIX B:

AERIAL MAPPING OF POTENTIAL NEW STATION LOCATIONS

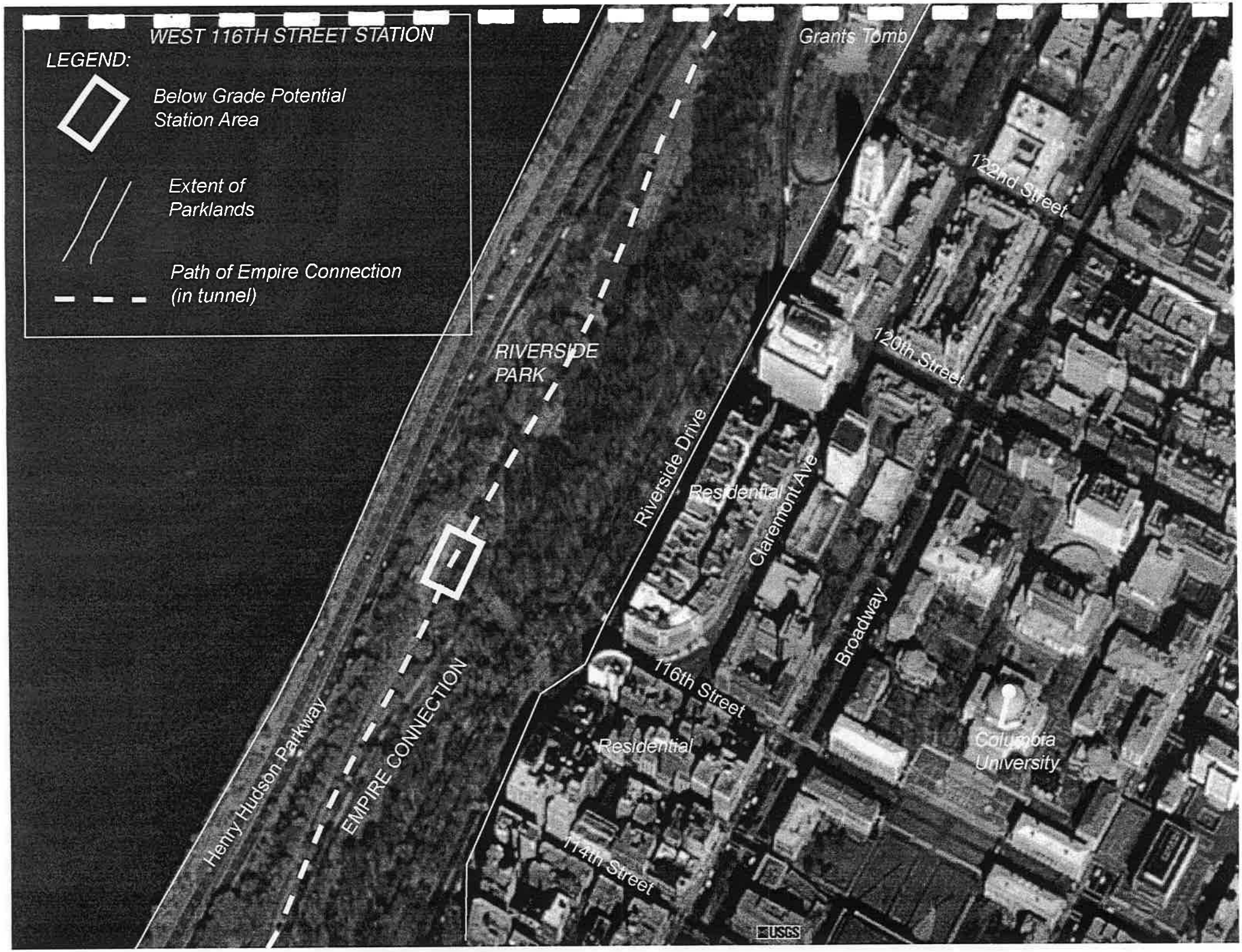

JACOB JAVITS CENTER STATION
LEGEND:
Below Grade Potential Station Area
Path of Empire Connection
Lincoln Tunnel Portal
Parking Lot
Short Line Bus Staging
Garage
Auto Repair Shop
39th Street
Gas Station
Motorcycle Repair Shop
Jacob Javits Convention Center
38th Street
Diner
Parking Lot
37th Street
Vacant
Eleventh Avenue
Plaza
Auto Repair Shop
36th Street
35th Street
Tenth Avenue
34th Street
USGS

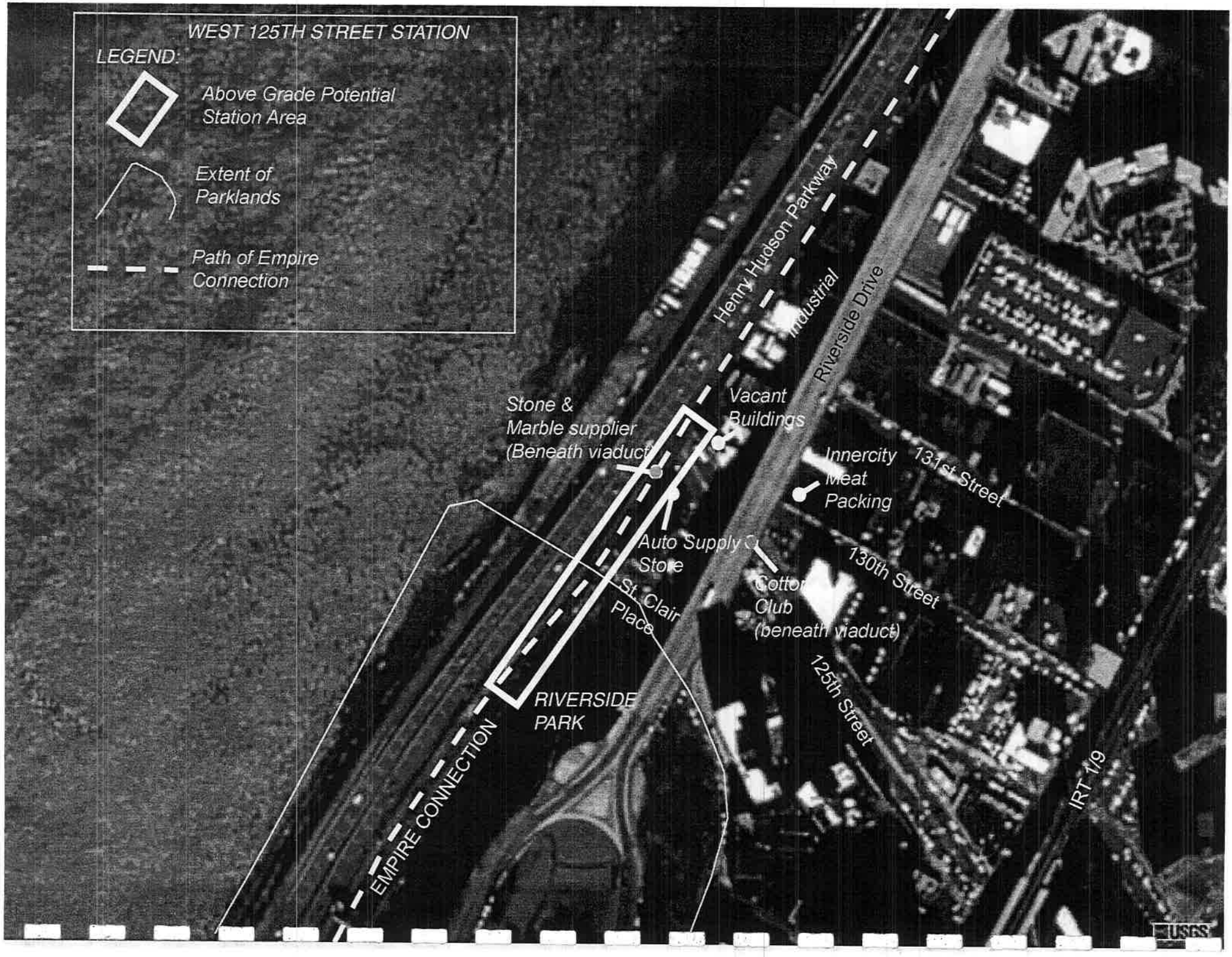

11th Avenue
10th Avenue
52nd Street
51st Street
50th Street
49th Street
48th Street
47th Street
9th Avenue
Clinton Family Inn
Skyline Hotel
Central Coat Linen Service
Parking Lot
Multi-Family Residential
Mixed Use
EMPIRE CONNECTION
WEST 49TH STREET STATION
LEGEND:
Below Grade Potential Station Area
Path of Empire Connection
USGS

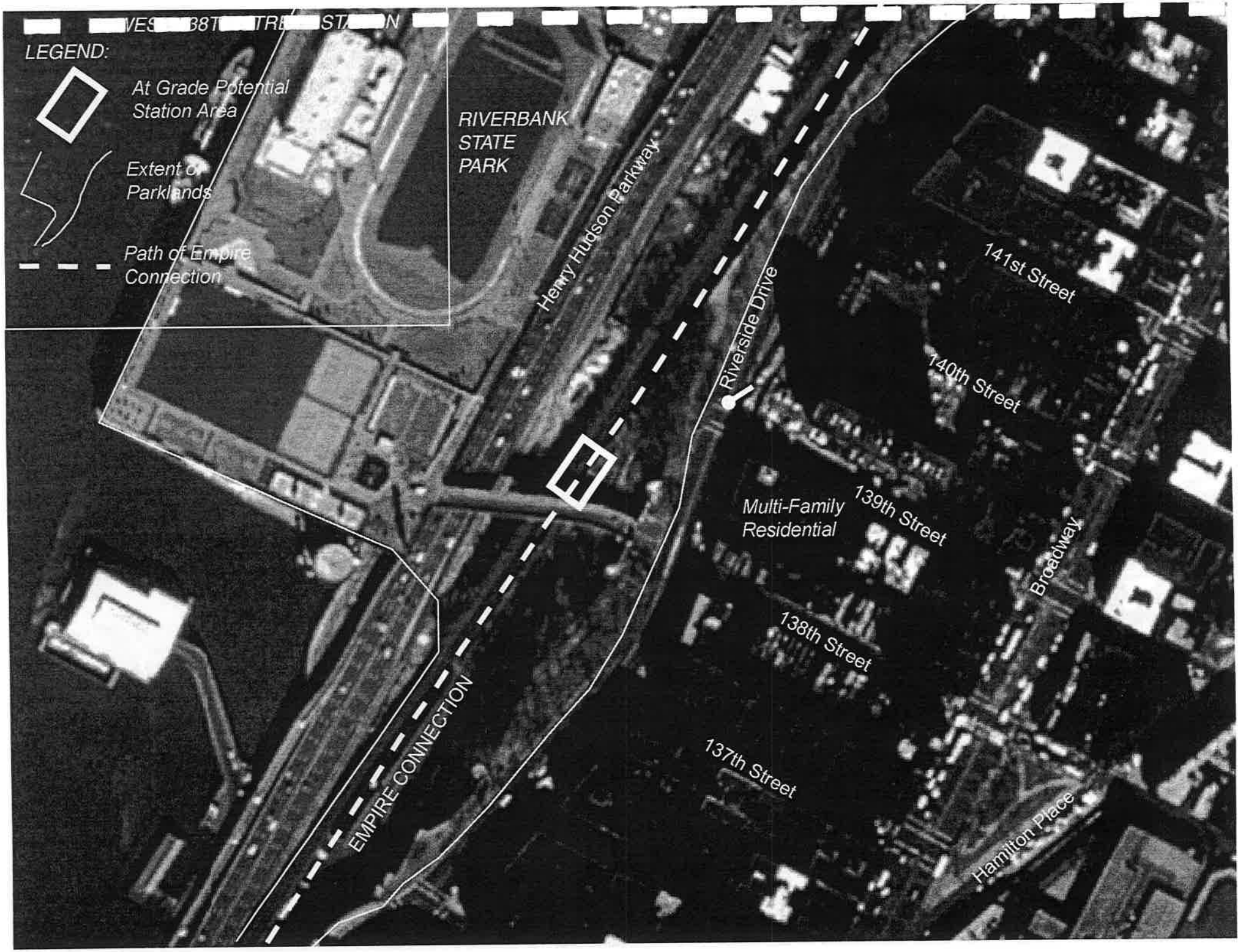

Riverside South Development (planned)
59th Street MTS
Parking Lot
60th Street
West Side Highway
Con Edison (IRT Building)
Gas Station
59th Street
Open Cut to Rail Road
Industrial
58th Street
John Jay College
BMW Landrover Dealership
57th Street
West End Avenue
56th Street
WEST 59TH STREET STATION
LEGEND:
Below Grade Potential Station Area
Extent of Riverside South Development (planned)
Path of Empire Connection
USGS

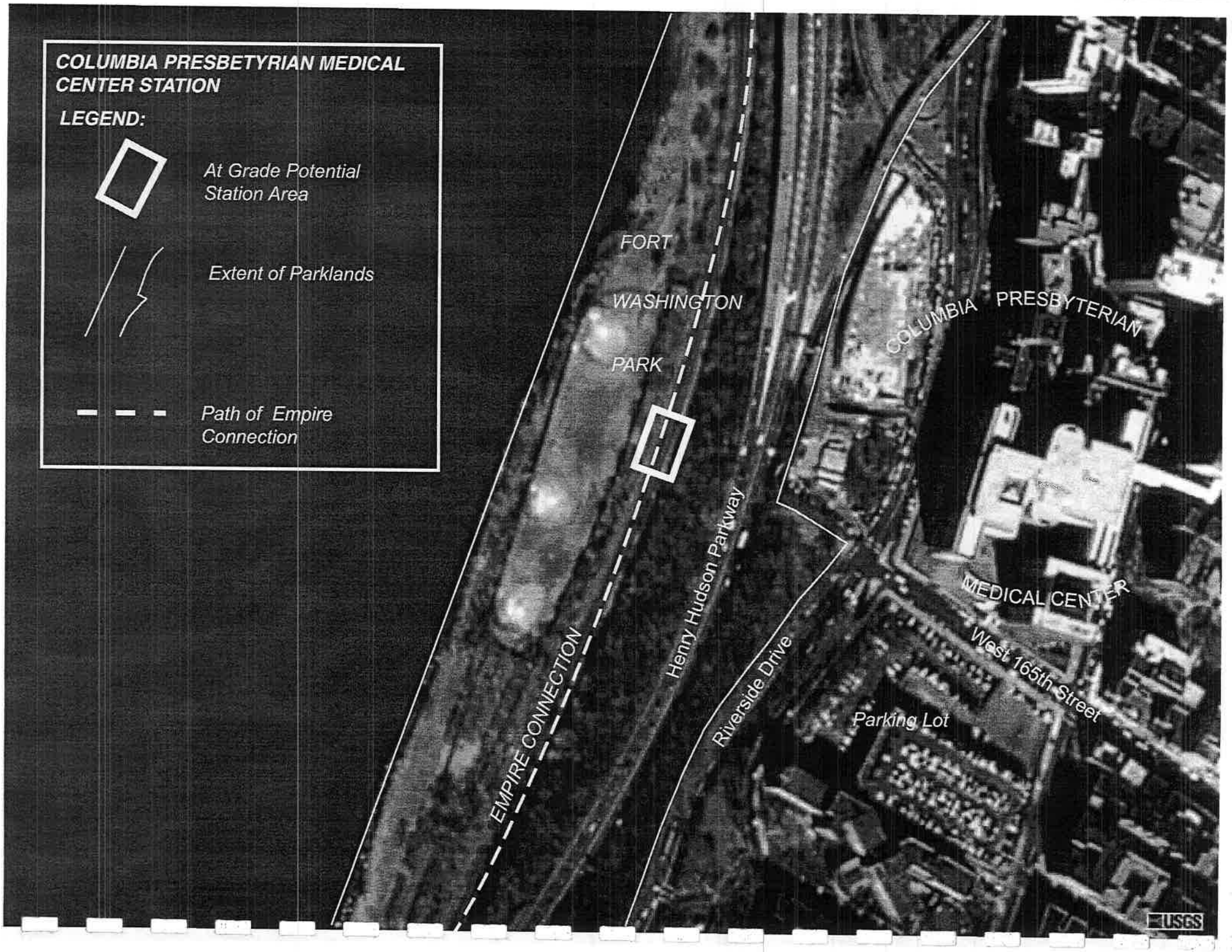
WEST 66TH STREET STATION
LEGEND:
At Grade Potential Station Area
Extent of Riverside South Development
Portion of Riverside South Development Completed
Path of Empire Connection
Riverside South Development (completed)
Riverside South Development (under construction)
Freedom Place
Lincoln Towers
West End Avenue
ABC Studios
EMPIRE CONNECTION
Miller Highway
66th Street
65th Street
64th Street
USGS

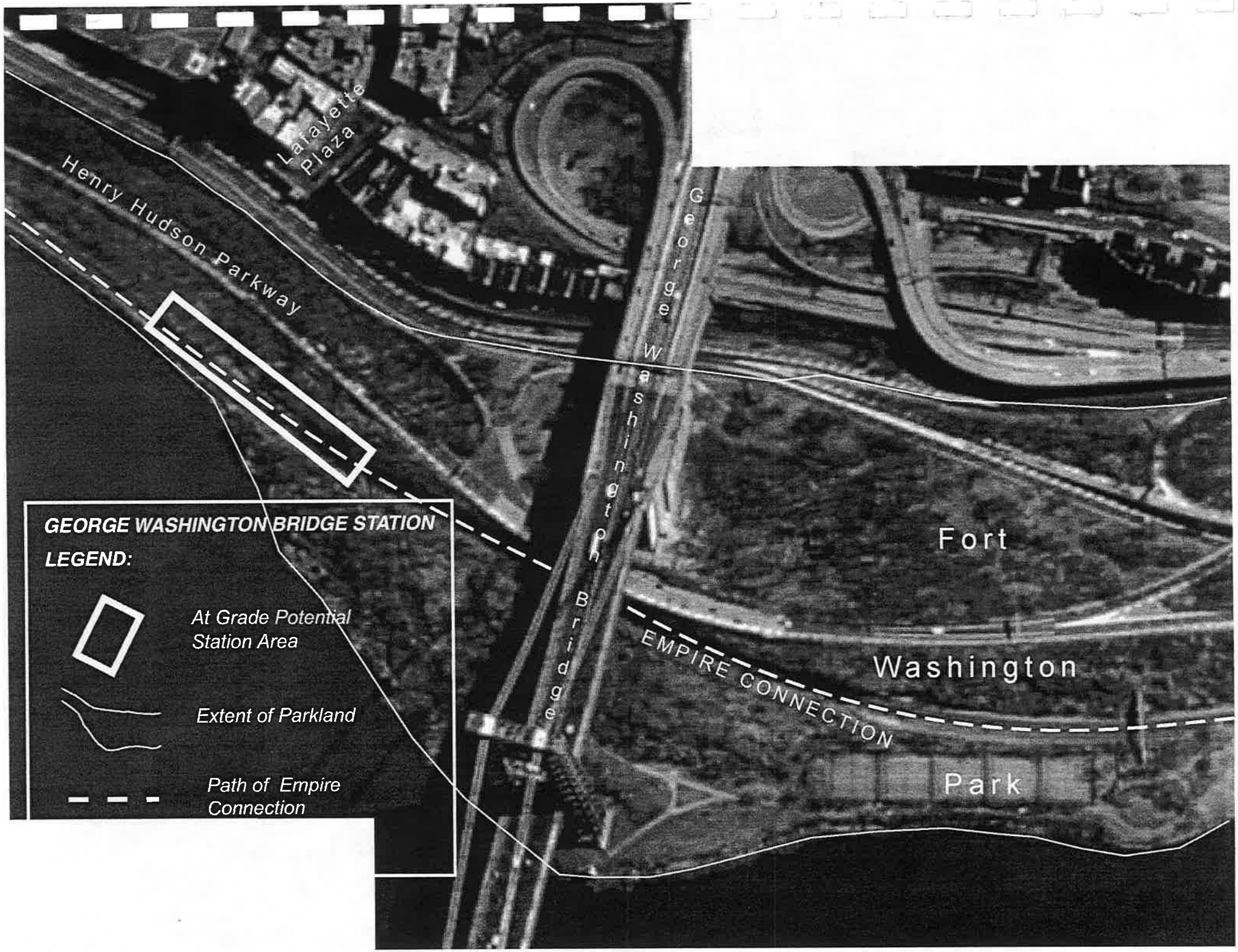
RIVERSIDE
PARK
Chatsworth
(historic)
72nd Street
under
construction
Residential
71st Street
West End Avenue
70th Street
Riverside South
Development
(completed)
Freedom Place
EMPIRE CONNECTION
Lincoln Towers
Riverside South
Development
(under construction)
WEST 72ND STREET STATION
LEGEND:
Below Grade
Potential Station
Area
Portion of Riverside
South Development
Completed
Path of Empire
Connection
USGS

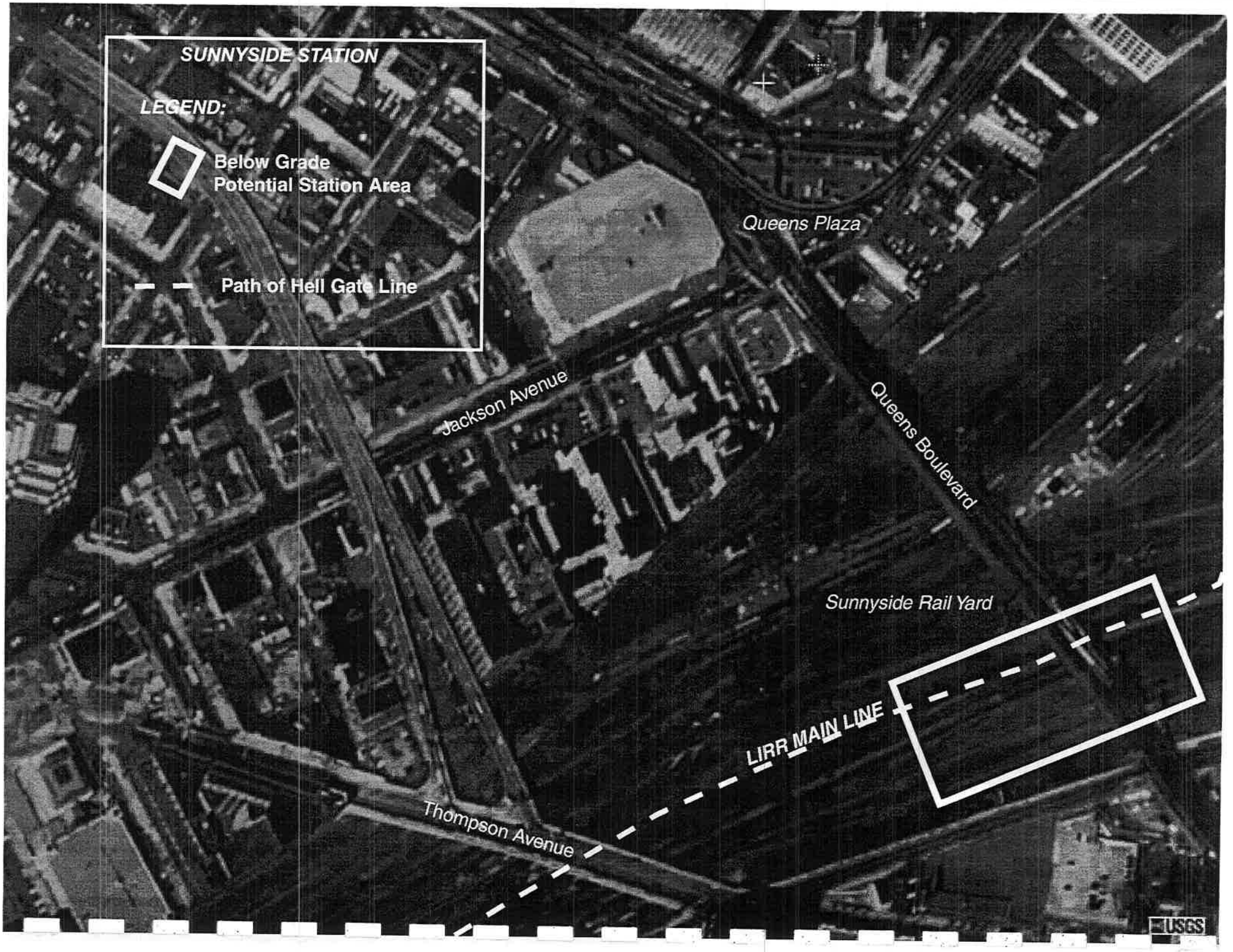

WEST 116TH STREET STATION
LEGEND:
Below Grade Potential Station Area
Extent of Parklands
Path of Empire Connection (in tunnel)
Grants Tomb
122nd Street
120th Street
RIVERSIDE PARK
Riverside Drive
Residential
Claremont Ave
Broadway
116th Street
Residential
Columbia University
Henry Hudson Parkway
EMPIRE CONNECTION
114th Street
USGS


WEST 125TH STREET STATION
LEGEND:
Above Grade Potential Station Area
Extent of Parklands
Path of Empire Connection
Henry Hudson Parkway
Industrial
Riverside Drive
Stone & Marble supplier (Beneath viaduct)
Vacant Buildings
Innercity Meat Packing
131st Street
Auto Supply Store
St. Clair Place
130th Street
Cotton Club (beneath viaduct)
125th Street
RIVERSIDE PARK
EMPIRE CONNECTION
IRT 1/9
USGS

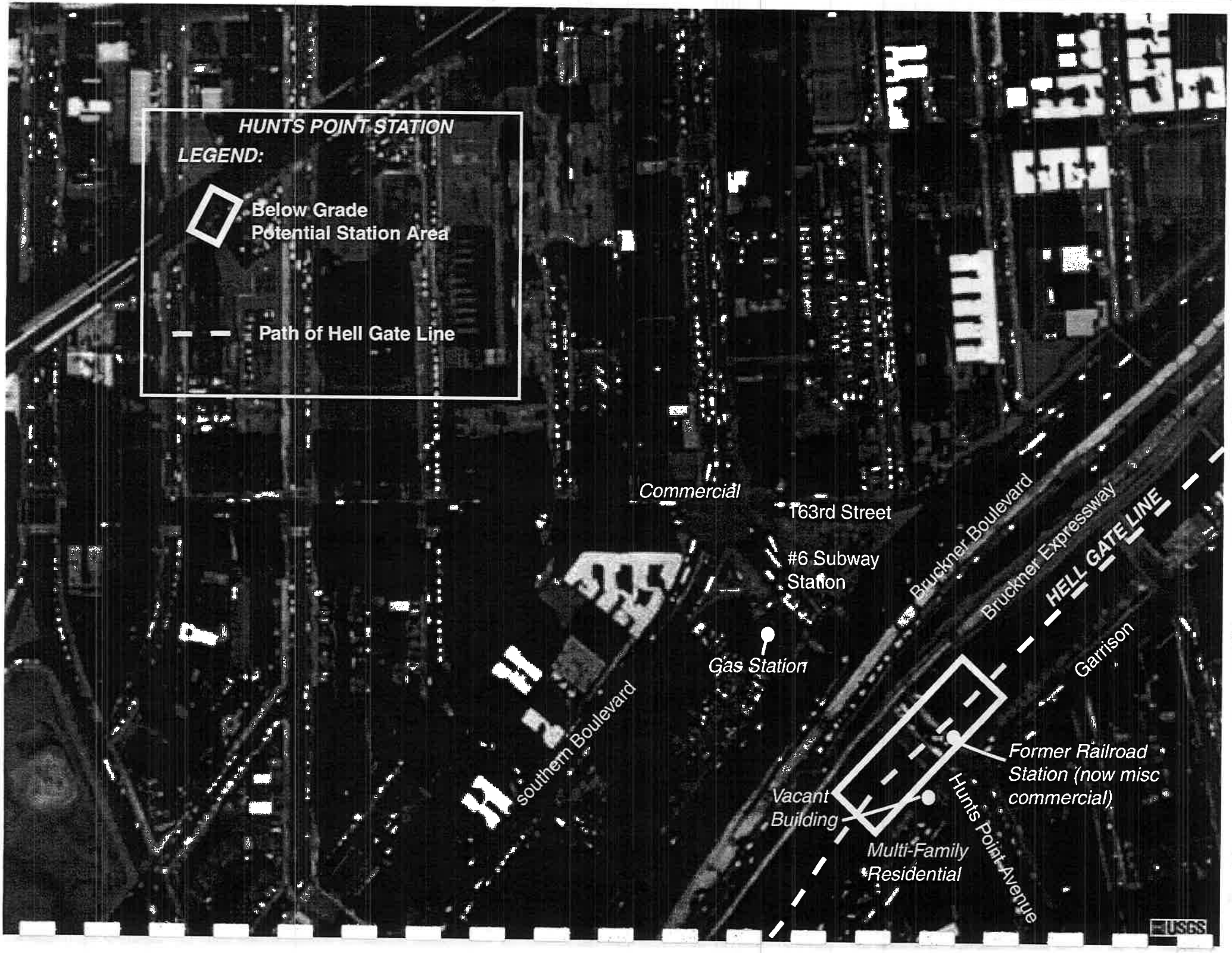

LEGEND:
At Grade Potential Station Area
Extent of Parklands
Path of Empire Connection
RIVERBANK STATE PARK
Henry Hudson Parkway
Riverside Drive
141st Street
140th Street
139th Street
138th Street
137th Street
Multi-Family Residential
Broadway
Hamilton Place
EMPIRE CONNECTION


COLUMBIA PRESBETYRIAN MEDICAL CENTER STATION
LEGEND:
At Grade Potential Station Area
Extent of Parklands
Path of Empire Connection
FORT
WASHINGTON
PARK
COLUMBIA PRESBYTERIAN
MEDICAL CENTER
West 165th Street
Parking Lot
Riverside Drive
Henry Hudson Parkway
EMPIRE CONNECTION
USGS

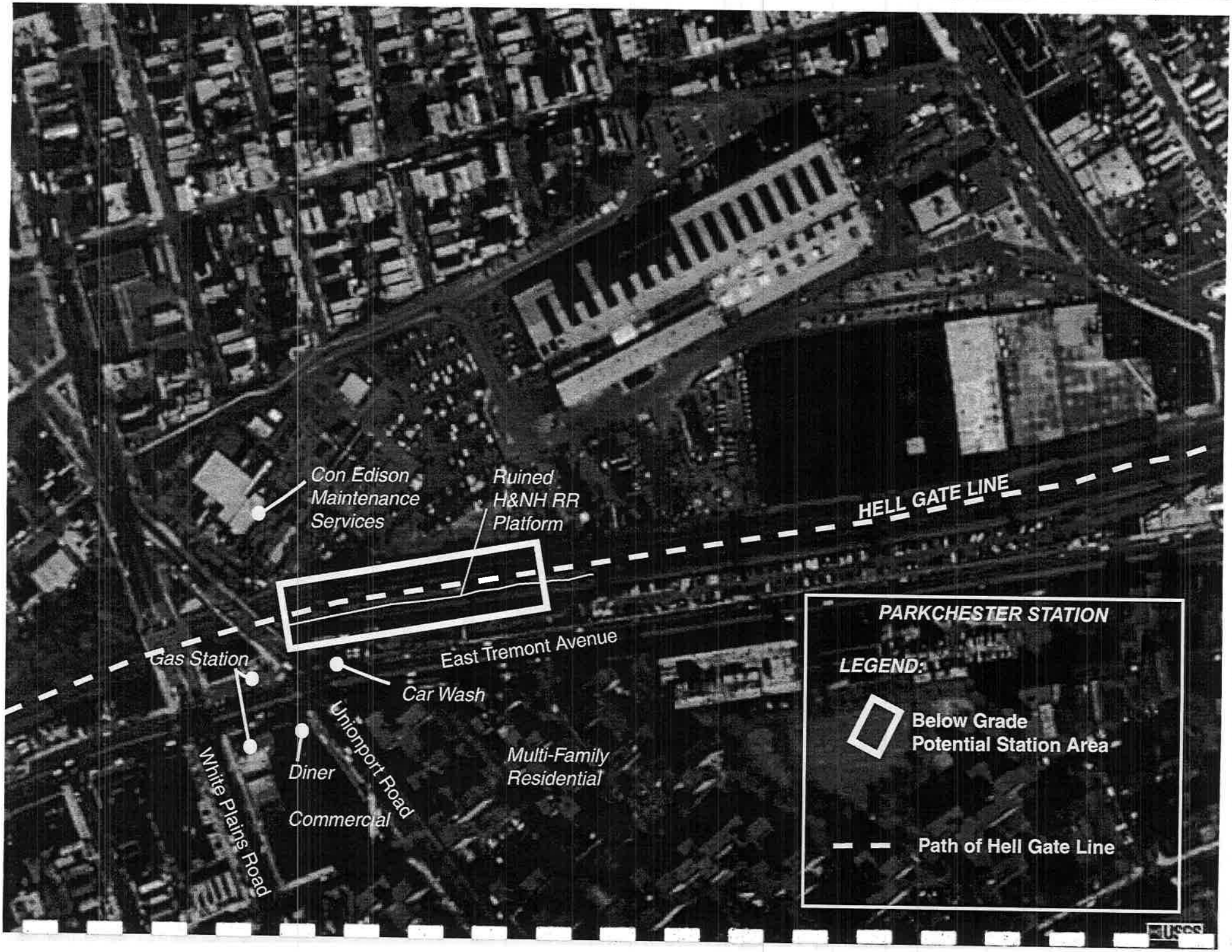

Lafayette Plaza
Henry Hudson Parkway
George Washington Bridge
Fort
Washington
Park
EMPIRE CONNECTION
GEORGE WASHINGTON BRIDGE STATION
LEGEND:
At Grade Potential Station Area
Extent of Parkland
Path of Empire Connection

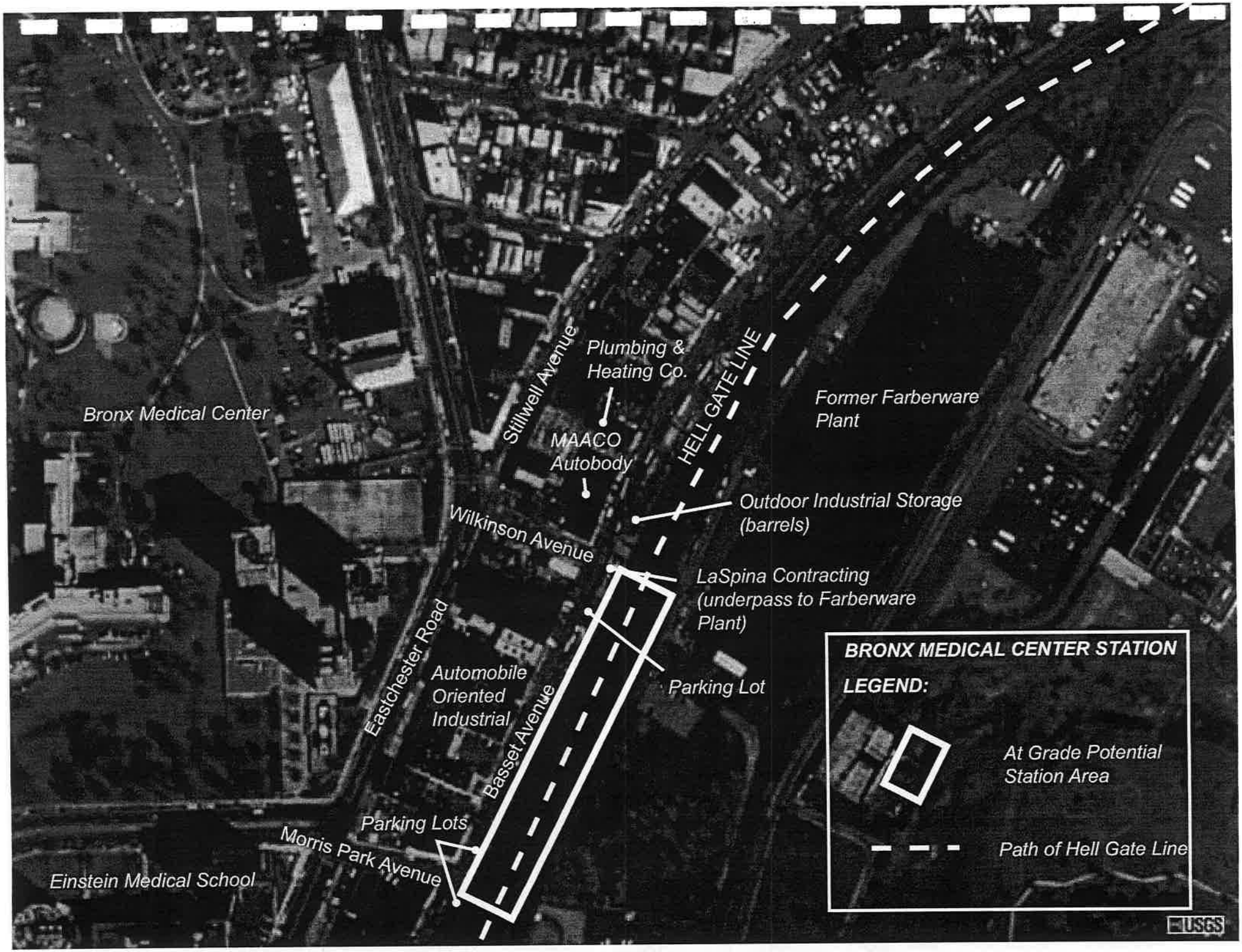

SUNNYSIDE STATION
LEGEND:
Below Grade
Potential Station Area
Path of Hell Gate Line
Queens Plaza
Jackson Avenue
Queens Boulevard
Sunnyside Rail Yard
LIRR MAIN LINE
Thompson Avenue
USGS

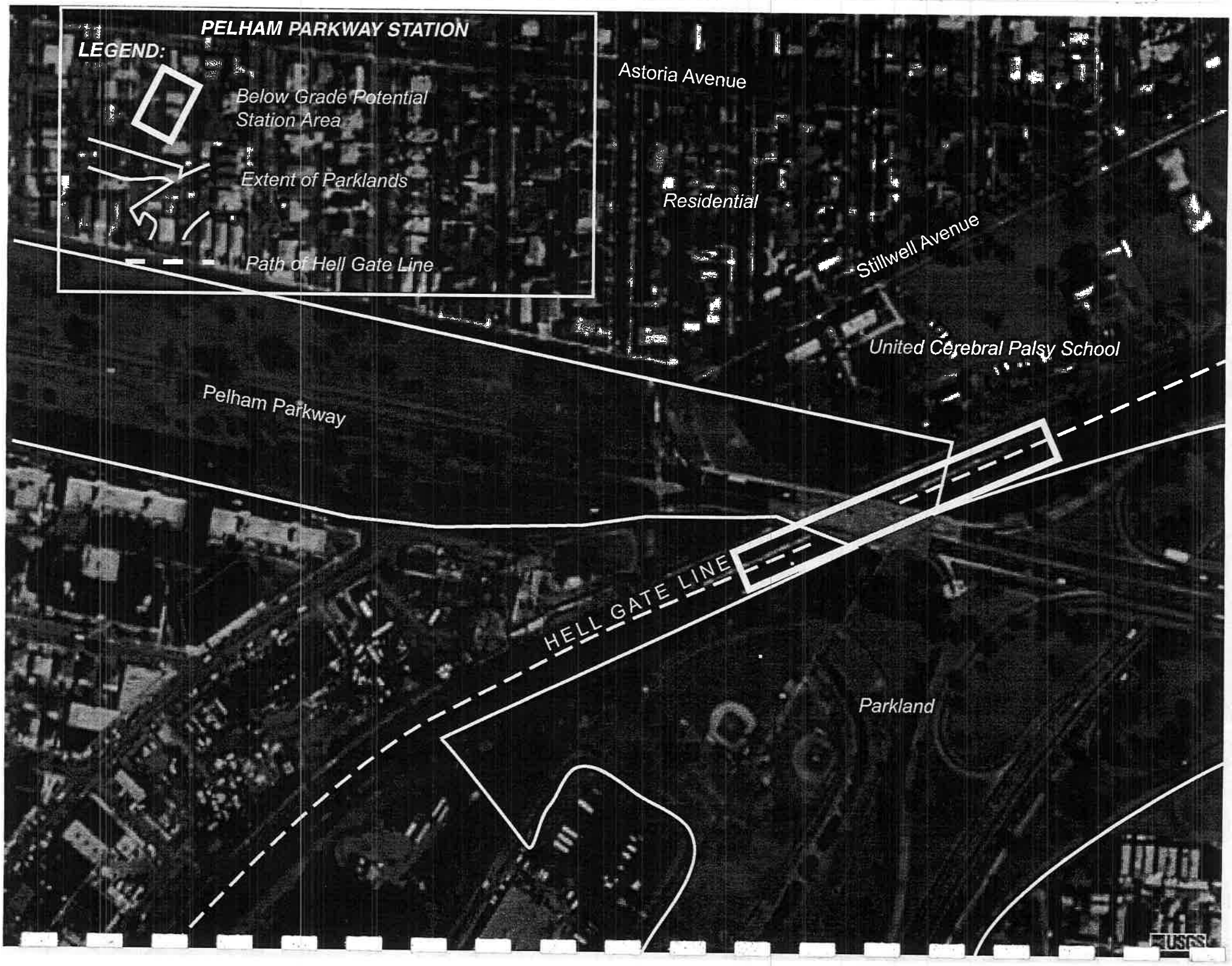
ASTORIA STATION
LEGEND:
Above Grade Potential Station Area connection to existing BMT station
Path of Hell Gate Line
HELL GATE LINE
Ditmars Boulevard
23rd Road
Commercial
Multi-Family Residential
BMT ELEVATED
BMT Station
Commercial
Multi-Family Residential
USGS

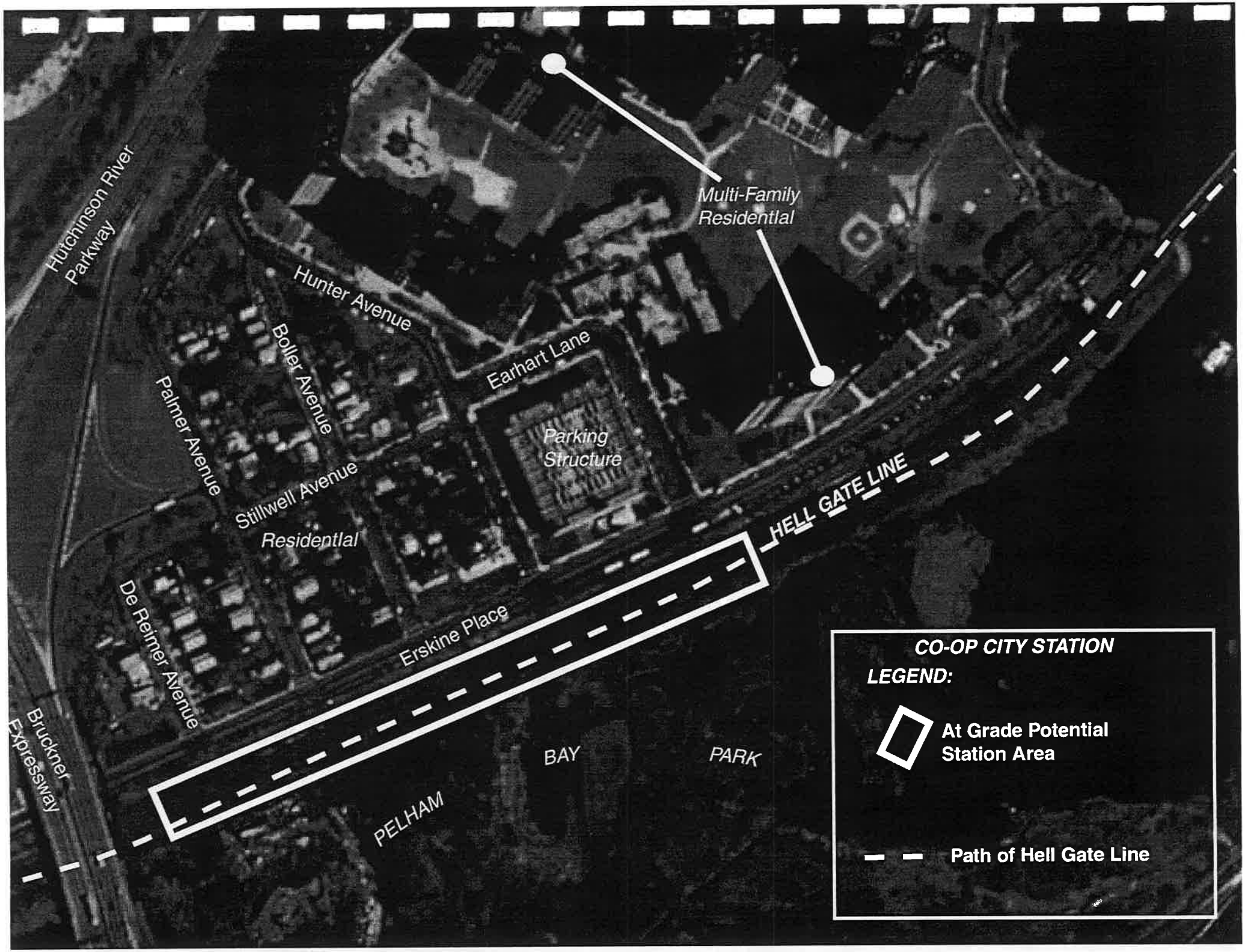

HUNTS POINT STATION
LEGEND:
Below Grade
Potential Station Area
Path of Hell Gate Line
Commercial
T63rd Street
#6 Subway
Station
Gas Station
Bruckner Boulevard
Bruckner Expressway
HELL GATE LINE
Garrison
southern Boulevard
Former Railroad
Station (now misc
commercial)
Vacant
Building
Multi-Family
Residential
Hunts Point Avenue
USGS

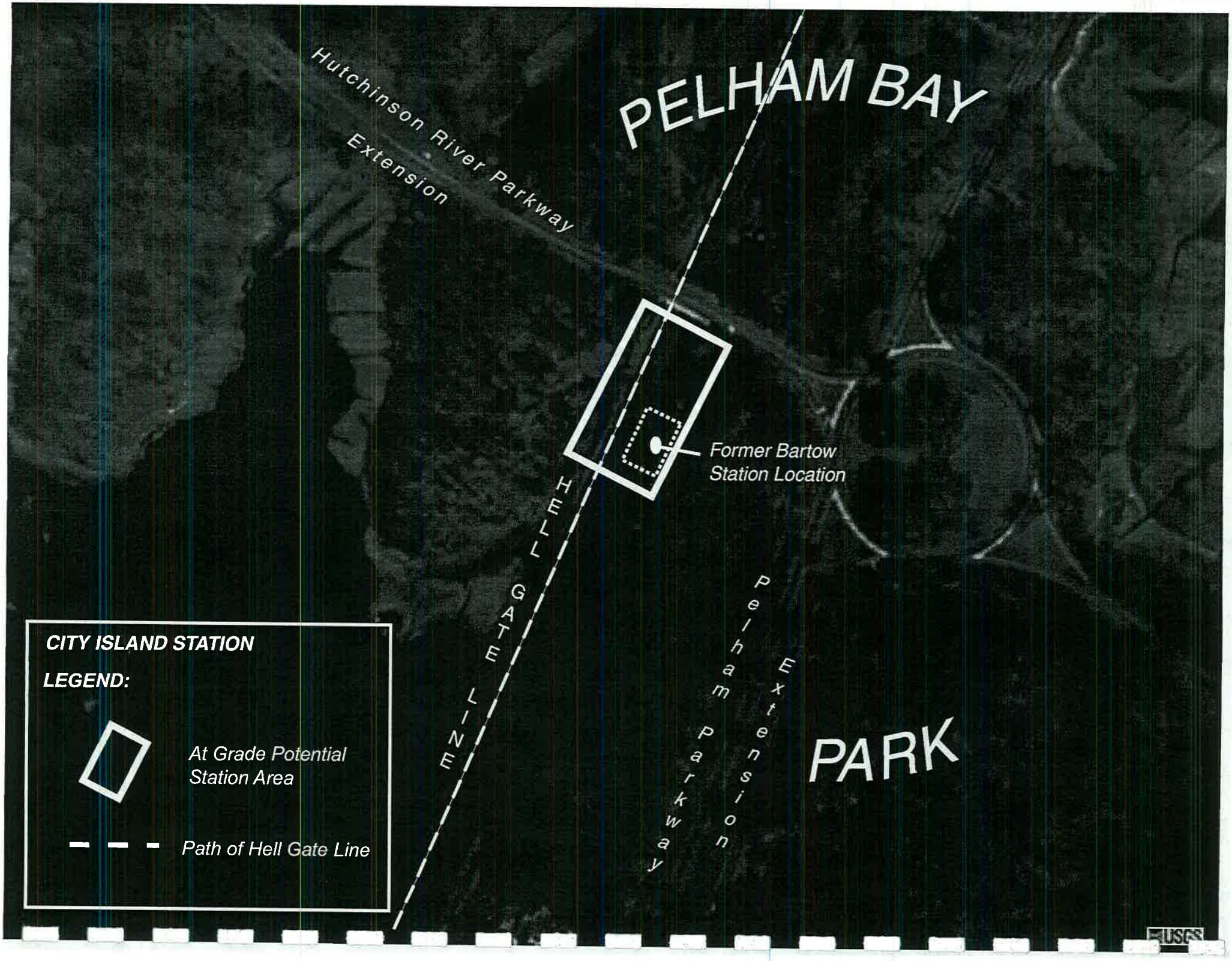
WESTCHESTER AVENUE STATION
LEGEND:
Below Grade Potential Station Area
Path of Hell Gate Line
Freeman Street
West Farms Road
Home Street
Sheridan Expressway
HELL GATE LINE
BRONX RIVER
Enterprise Car Rental and Car Wash
Multi-Family Residential
Restaurant
Laundromat
Westchester Avenue
Auto Repair
Longfellow Avenue
#6 Pelham Line Elevated
Former Hartford & NH RR Westchester Ave Station Building
Whitlock Avenue Elevated Station
USGS

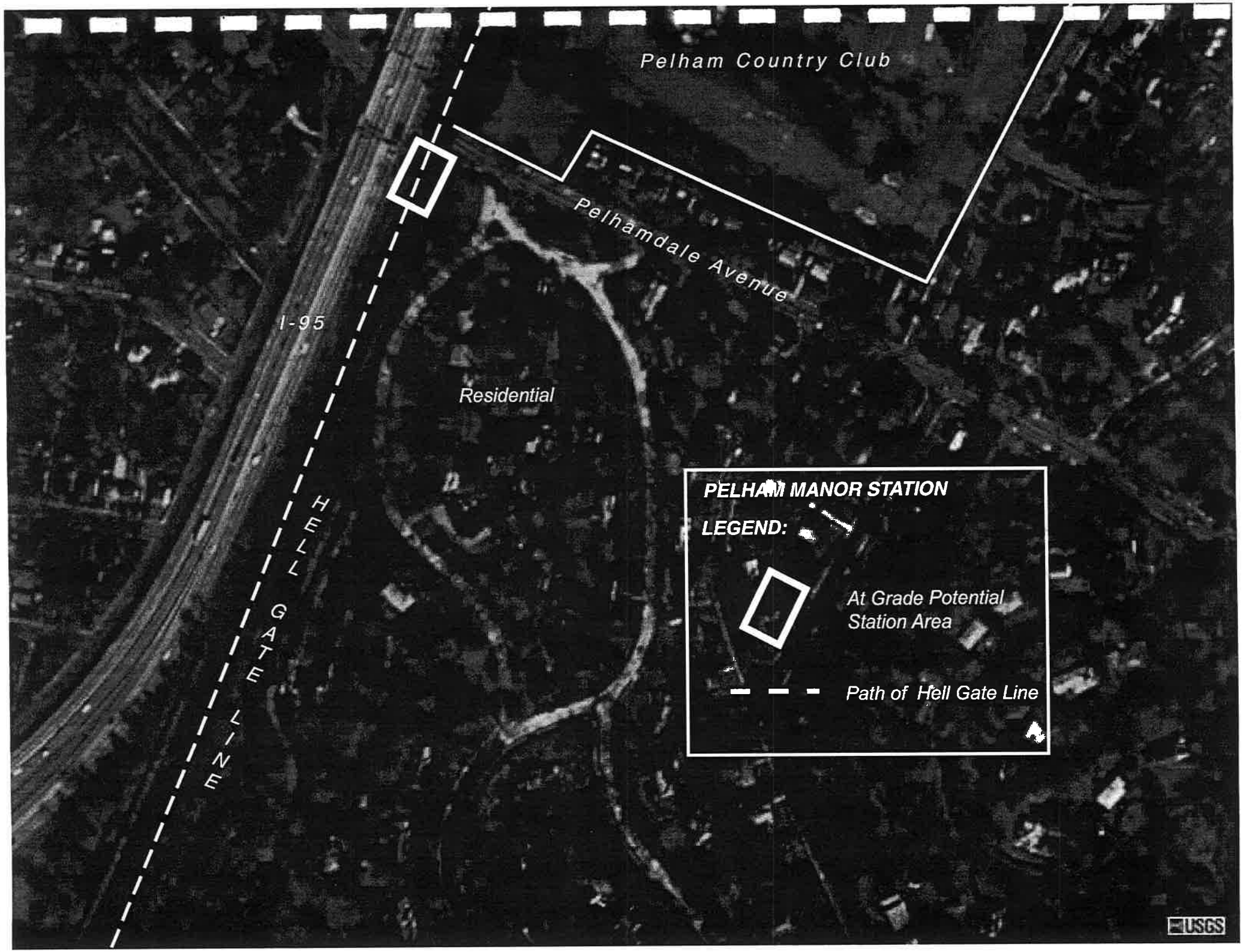

Con Edison
Maintenance
Services
Ruined
H&NH RR
Platform
HELL GATE LINE
East Tremont Avenue
Gas Station
Car Wash
Unionport Road
White Plains Road
Diner
Commercial
Multi-Family
Residential
PARKCHESTER STATION
LEGEND:
Below Grade
Potential Station Area
Path of Hell Gate Line


Bronx Medical Center
Stillwell Avenue
Plumbing &
Heating Co.
HELL GATE LINE
Former Farberware
Plant
MAACO
Autobody
Outdoor Industrial Storage
(barrels)
Wilkinson Avenue
LaSpina Contracting
(underpass to Farberware
Plant)
Eastchester Road
Automobile
Oriented
Industrial
Basset Avenue
Parking Lot
Parking Lots
Morris Park Avenue
Einstein Medical School
BRONX MEDICAL CENTER STATION
LEGEND:
At Grade Potential
Station Area
Path of Hell Gate Line
USGS


PELHAM PARKWAY STATION
LEGEND:
Below Grade Potential Station Area
Extent of Parklands
Path of Hell Gate Line
Astoria Avenue
Residential
Stillwell Avenue
United Cerebral Palsy School
Pelham Parkway
HELL GATE LINE
Parkland
USGS


Hutchinson River Parkway
Hunter Avenue
Boller Avenue
Palmer Avenue
Earhart Lane
Multi-Family Residentlal
Parking Structure
Stillwell Avenue
Residentlal
HELL GATE LINE
De Reimer Avenue
Erskine Place
Bruckner Expressway
BAY
PARK
PELHAM
CO-OP CITY STATION
LEGEND:
At Grade Potential Station Area
Path of Hell Gate Line


PELHAM BAY
Hutchinson River Parkway Extension
Former Bartow Station Location
HELL GATE LINE
Pelham Parkway Extension
PARK
CITY ISLAND STATION
LEGEND:
At Grade Potential Station Area
Path of Hell Gate Line
USGS


Pelham Country Club
Pelhamdale Avenue
I-95
Residential
HELL GATE LINE
PELHAM MANOR STATION
LEGEND:
At Grade Potential Station Area
Path of Hell Gate Line
USGS

APPENDIX C:

COST ESTIMATING ASSUMPTIONS AND FACTORS

COST ESTIMATING ASSUMPTIONS AND FACTORS FOR POTENTIAL NEW STATIONS

Cost Item	Unit Cost*	
High-level platforms, ramps, shelters, and stairs	$3,530.00	per linear foot
Full-length Canopy	$1,200.00	per linear foot
Utility Feeds (Connection to existing services)	$300,000.00	each
Elevators	$350,000.00	per elevator, 1-story hydraulic
	or	
	$500,000.00	per elevator, cable-hauled
Construction Contingency	**125%**	of cost
Soft Costs (Design, Construction Management, Inspection, Legal, Permitting, Administration)	**135%**	of cost, post-constuction contingency
Amtrak Force Account (Flagging, Access Agreements)	**125%**	of cost, post-soft costs
Project Contingency	**105%**	of all prior costs

Miscellaneous Additional Costs, if necessary:

Track and Powering Relocation for Island Platforms	$180.00	per linear foot track and catenary relocation
	or	
	$130.00	per linear foot track and third rail relocation
Overpass	$600,000.00	for overpass structure (including stairs; elevators extra)
Structural Modifications	$1,000.00	per square foot of work

*Unit costs derived from Study's Capital Cost Estimating Methodology Report, and from best-practice assumptions.

ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATES FOR POTENTIAL NEW STATIONS

Station	Station Type	Total Cost	Cost Category[1]
HUDSON LINE			
George Washington Bridge	4 car, side platforms, overpass, built access	$20,698,440.00	High
Columbia Presbyterian	4 car, side platforms, overpass, built access	$20,698,440.00	High
West 138th Street	6 car, island platform	$10,336,830.00	Medium
West 125th Street	4 car, side platforms, sound barrier	$11,710,440.00	Medium
West 116th Street	6 car, island platform, in tunnel	$12,436,830.00	Medium
West 72nd Street	6 car, island platform	$7,186,830.00	Low
West 66th Street	6 car, island platform	$7,186,830.00	Low
West 59th Street	6 car, island platform, overpass	$9,181,830.00	Low
West 49th Street	4 car, island platform	$5,498,220.00	Low
Jacob Javits Center	6 car, single side platform, structural	$8,530,830.00	Low
NEW HAVEN LINE			
Peham Manor	6 car, side platforms, overpass	$18,447,660.00	Medium
City Island	6 car, side platforms, overpass	$14,247,660.00	Medium
Co-Op City	6 car, island platform, overpass	$9,181,830.00	Low
Pelham Parkway	6 car, side platforms, overpass	$14,247,660.00	Medium
Bronx Medical Center	6 car, island platform, overpass	$9,181,830.00	Low
Parkchester	6 car, island platform	$7,186,830.00	Low
Westchester Avenue	6 car, island platform	$7,186,830.00	Low
Hunts Point	6 car, island platform	$7,186,830.00	Low
Astoria	4 Car, side platforms, structural	$26,620,440.00	High
Sunnyside	6 Car, side and island platforms	0[2]	Low

Notes:

[1]The cost categories for stations are: Low ($0-10 Million), Medium ($10-20 Million), High ($20 Million plus)

[2]As the cost of Sunnyside Station is included in the East Side Access Project, this Study assumes no construction cost for Penn Station access purposes.